

HIGH TECHNOLOGY OFFICE EVALUATION SURVEY - A PILOT STUDY

Arthur Rubin

**U.S. DEPARTMENT OF COMMERCE
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and Technology
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**Prepared for:
Public Building Service
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NIST

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Abstract

This report is intended to provide insights about how offices and workstations are planned and designed in the private and public sectors. Among the issues explored are the quality workplace, the effects of technology on design, space allocations, and systems furnishings. The data were collected by a detailed questionnaire survey, administered with the cooperation of the Corporate Architects Committee of the American Institute of Architect (AIA). The respondents were designers and facility managers of major corporations and governmental agencies with broad planning experience and major design responsibilities. The sample is a limited one, including only twenty-two respondents, and therefore the findings are indicative of current design practices and experiences. The survey was designed to cover a broad range of topics and provide the opportunity to comment freely about them. As a result, much of the data is in narrative form.

Keywords:

Acoustics, air quality, design process, ergonomics, furniture systems, lighting, open-office design, post-occupancy-evaluation, space requirements, thermal comfort.

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1. Background

This report is intended to provide insights about how offices and workstations are planned and designed in the private and public sectors. Among the issues explored are the quality workplace, the effects of technology on design, space allocations, and systems furnishings. The data were collected by means of a detailed questionnaire survey, administered with the cooperation of the Corporate Architects Committee of the American Institute of Architect (AIA). The respondents were designers and facility managers of major corporations and governmental agencies with broad planning experience and major design responsibilities. The sample is a limited one, including only twenty-two respondents, and therefore the findings are only indicative of current design practices and experiences. However, the results are consistent with recent research studies (1,2).

The survey was designed to cover a broad range of topics and provide the opportunity to comment freely about them. As a result, much of the data is presented in narrative form. These comments will be summarized below, as will the results of the more structured questions, which can be summarized quantitatively primarily in percentages. Detailed analyses are precluded by the limited sample. Since all questions were not answered by all respondents, the number of responses are also indicated.

2. Results

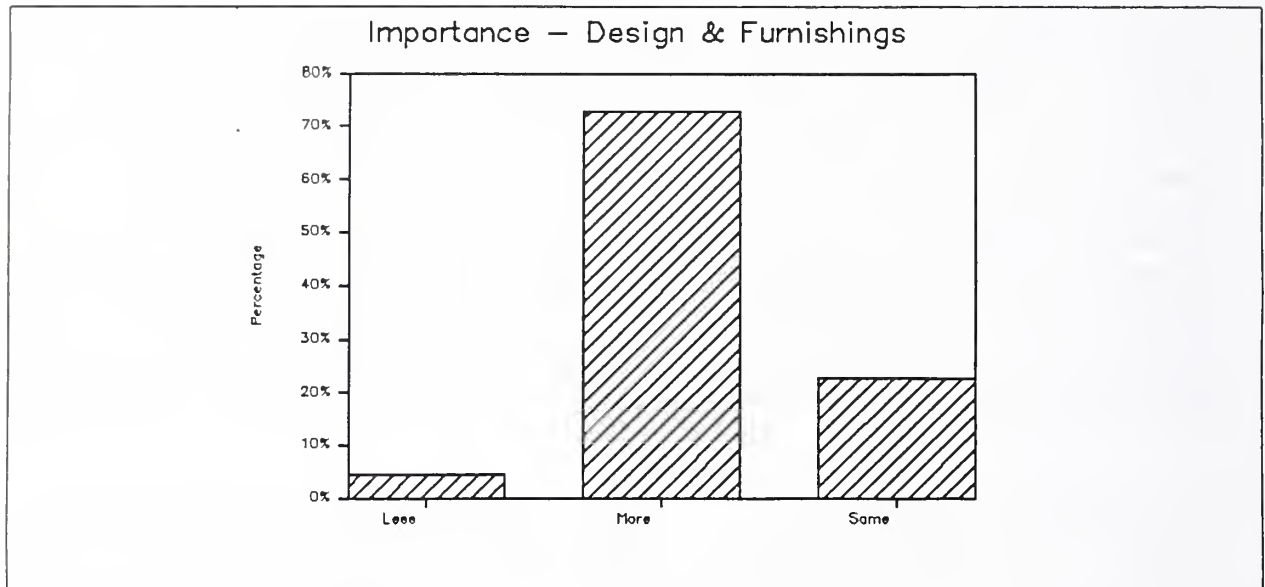
In response to several general questions, it was determined that 65.3 percent of the office workers covered by the survey used computers. Shared workstations were used by 11.3 percent. Individual workstation file space averaged 9 linear feet.

The next general topic explored was the importance of design and furnishings today as compared with five years ago. The findings indicate their increased importance.

Table 2.1 Importance of design and furnishings

<u>Rating</u>	<u>Number</u>	<u>Percentage</u>
Less	1	4.55
More	16	72.73
Same	5	22.73
Total	22	

Figure 2.1 Importance of design and furnishings



2.1 High Quality Workplace

When asked to list the features of a 'high quality workplace', a broad range of issues were addressed. The following characteristics received more than one mention, the actual number indicated by ():

functional (10)
 privacy (6)
 aesthetics (6)
 storage (6)
 economical (4)
 flexible (4)
 comfortable (3)
 light (3)
 space (3)
 ergonomics (2)

In exploring whether the definition of a high quality workplace has changed recently, the following comments were typical:

- * Less emphasis on amount of space given
- * More emphasis on ergonomics; adjustability of surface and light
- * Need to be more responsive to PC functions
- * More design sophistication
- * Expanded power capabilities

2.2 Planning and Programming

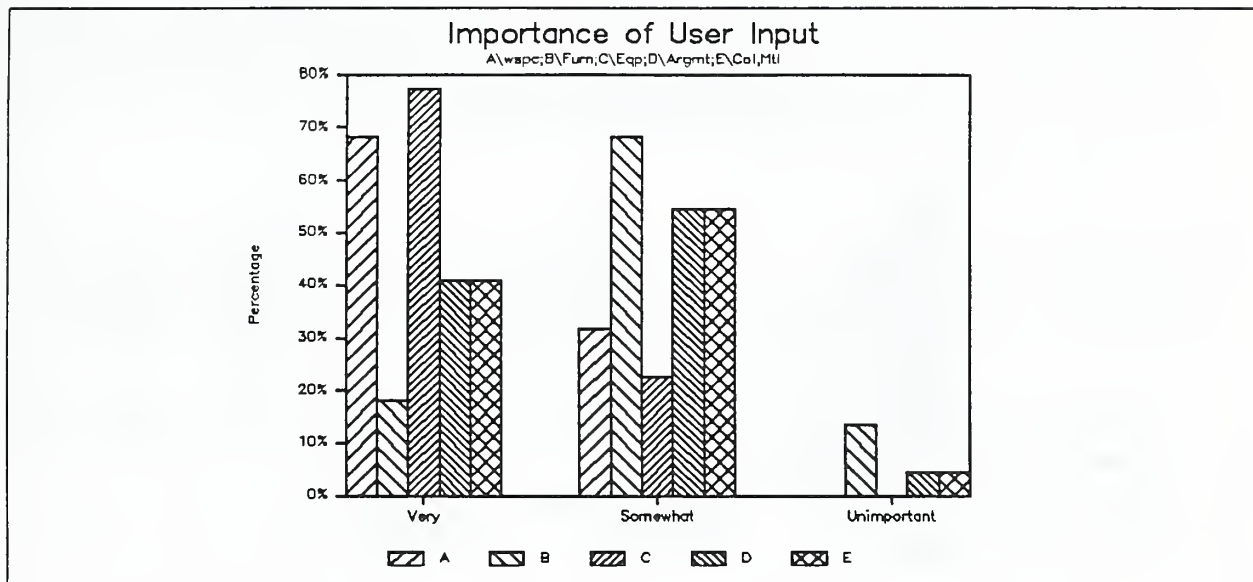
The topic of planning and programming was then addressed. Twenty of the twenty-two organizations surveyed did their own planning and programming. User input in making design decisions was then explored by asking:

How important is user input in the following design features?

Table 2.2 Importance of User Input to Design

Design Feature	Figure Code	Very		Somewhat		Unimportant		(N=22)
		#	%	#	%	#	%	
Workspace	A	15	(68)	7	(32)			
Furnishings	B	4	(18)	15	(68)	3	(14)	
Equipment	C	17	(77)	5	(23)			
Arrangement	D	9	(41)	12	(55)	1	(04)	
Color	E	9	(41)	12	(55)	1	(04)	

Figure 2.2 User input to design



The major items cited as being very important for user input were equipment and workspace design.

2.2.1 Workstation Design Process

The workstation design process was then explored to determine if generic corporate design strategies could be identified.

Is there a common approach for workstation design, location, etc?

Respondents differed considerably in their answers to this question. Corporate standards were cited by three companies while two others noted that the approach employed depends on the facility type or area being designed. Teamwork among organizational groups and individuals was mentioned by two respondents. The remaining comments included two opposite schemes:

- * Exterior private offices and interior open spaces
- * Open clerical positions at windows, enclosed offices inside.

In reviewing workstation design procedure the use of in-house standards as a guide received prominent mention; modifications were made to suit functional needs. The standards were based on organizational policies and/or user interviews and surveys. Mockups were suggested as an effective way of evaluating proposed design and furnishings options. Detailed planning should be responsive to design constraints, e.g. space limitations.

2.3 CAD Systems

Since CAD systems are becoming more prominent as design aids this topic was then explored; 13 of the 22 organizations used them. While virtually all were used to maintain information about workstations, the other data varied considerably. Components, furnishings, and connections predominated, with some mention of mechanical and electrical systems and space.

2.4 Space Related Issues

The process employed to determine space needs differed for the organizations surveyed. Six employed standards, while 4 used forecasts and 4 others relied on user surveys. Others employed a variety of other approaches, including:

- * Departmental historical data, program projections & approved yearly budgets
- * Examination of job functions
- * Determination of departmental special needs
- * Head count
- * Building module

As to the efficiency of space usage, usable space was 69% of the total space on the average.

2.4.1 Space Categories

With respect to office space categorizations, 8 organizations employed 'office type, special purpose, storage', 4 used 'office type', 'office type, special purpose' and 'office type, storage' were each used by 2 organizations. One respondent used 'office type, storage, laboratory'.

Other space categories included:

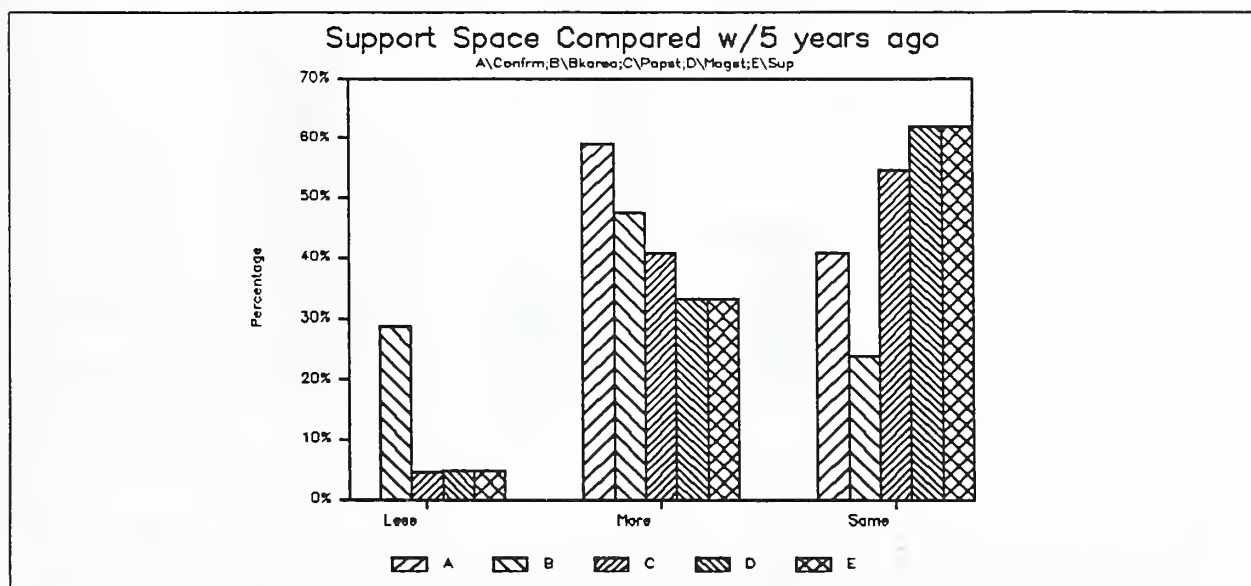
- * Workspace = closed: office, conference; open: workstation, conference, filing, etc.
- * Furnishings - conventional or systems
- * Office/production, type of laboratory, computer
- * Executive, professional, other
- * Net vs Gross; net includes support and circulation, not service
- * General administrative vs special (training, lounge, fitness)

An important factor in determining space requirements is support spaces. The next question concerned the current use of several categories of support spaces, as compared with five years ago.

Table 2.3 Support spaces compared, present with 5 years ago

Type of Space	Fig Code	More		Same		Less		Total	N
		#	%	#	%	#	%		
Conference rooms	A	13	(59)	9	(41)			22	
Break/smoking areas	B	6	(29)	10	(48)	5	(33)	21	
Paper storage	C	9	(41)	12	(55)	1	(05)	22	
Magnetic storage	D	7	(33)	13	(62)	1	(05)	21	
Work support e.g. duplicating	E	10	(45)	10	(45)	2	(09)	22	

Figure 2.3 Support spaces compared



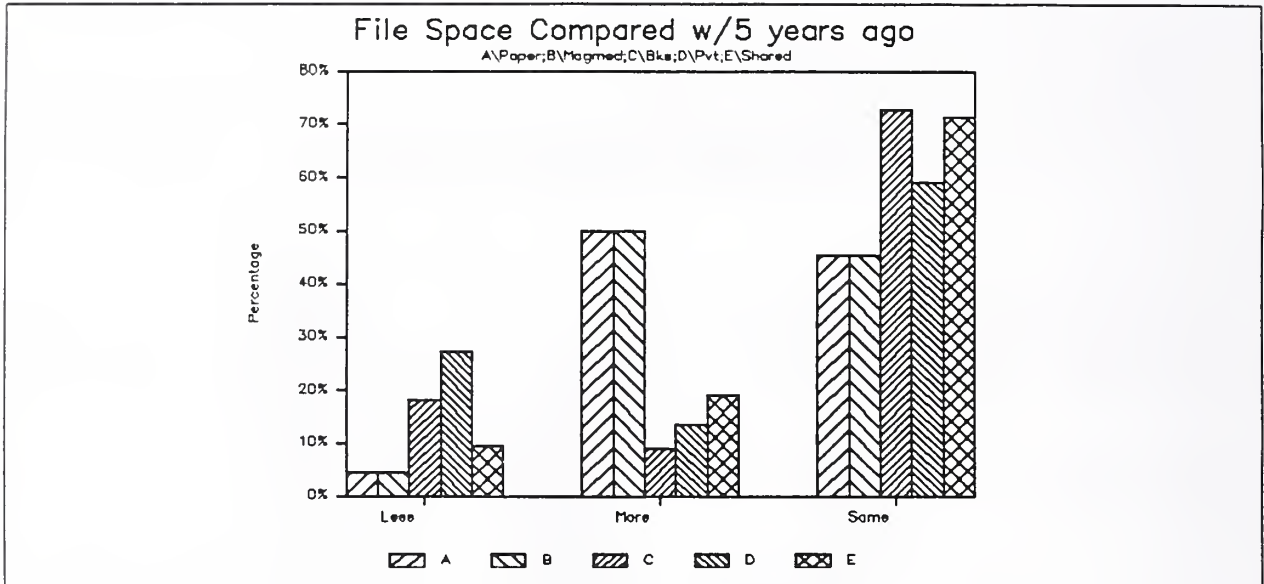
With respect to conference rooms, 8 respondents indicated there was an increased need for them while 7 saw no difference in requirements, when compared with usage 5 years ago. With the exception of 'break/smoking areas' category, on the average considerably more space was required for all of the activities examined.

The trend in file space requirements was then addressed in more detail. The greatest increase was for magnetic media, but more paper files were also noted. The only reductions were private file space and reference books.

Table 2.4 File spaces compared, present with 5 years ago

Type of Files	Fig Code	More		Same		Less		Total N
		#	%	#	%	#	%	
Paper	A	6	(28)	14	(67)	1	(05)	21
Magnetic media	B	11	(50)	10	(45)	1	(05)	22
Books, ref documents	C	2	(09)	16	(72)	4	(18)	22
Private files	D	3	(14)	13	(59)	6	(27)	22
Shared files	E	4	(19)	15	(71)	2	(10)	21

Figure 2.4 File space comparison



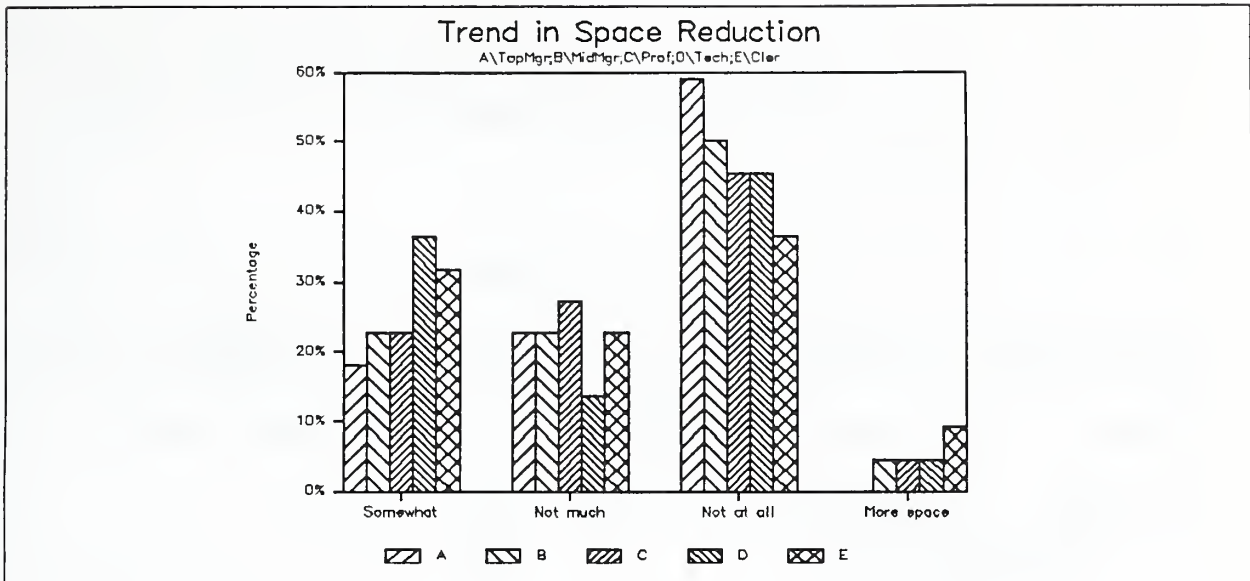
2.4.2 Space reduction trends

The trend to reduce space for different categories of office workers was then examined. The data were rather evenly divided between no reduction and some. Few organizations reported the use of more space.

Table 2.5 Space reduction trends for job categories

Emp Cat	Code	Somewhat		Not Much		Not at All		More Space	Tot
		#	%	#	%	#	%		
Top mgmt	A	4	(18)	5	(23)	13	(59)		22
Middle mgt	B	5	(22)	5	(23)	11	(50)	1 (05)	22
Professional	C	5	(23)	6	(27)	10	(45)	1 (05)	22
Technical	D	8	(36)	3	(14)	10	(45)	1 (05)	22
Clerical	E	7	(32)	5	(23)	8	(36)	2 (09)	22

Figure 2.5 Space reduction trends



2.5 Workstations

The first question addressed the categories of workstations used.

What are categories of workstations?

Workstation categories were unique for each organization, and sometimes not standardized within a company. Some were based upon job titles, others on dimensions, and still others on a combination of these two factors.

The bases for workstation assignments were primarily job category (12) and function/job category (10). Status (13) and equipment (17) were also given considerable mention. Formal workstation categories were used by 19 of the 21 respondents, with the average number of categories being 6.5.

Some representative examples of categories are:

- * Manager, professional, supervisor, technical, clerical, engineer
- * Manager, professional, technical, clerical/ADP, secretarial
- * Secretary, clerical, computer, general
- * Secretarial, professional, secretarial with word processor, professional with VDT
- * Entry clerical, clerical, para-professional, professional, manager, director
- * Vice-president, director, department head, manager, engineer, draftsman, technician, secretary, clerk

2.5.1 Shared Workstations

Only 15% of the workstations described were shared; 4 respondents indicated that the trend in sharing is down, while only 1 noted a slight increase. Shared stations were associated with special conditions, e.g. high technology facilities, second shifts, computer terminals.

2.5.2 Workstation Sizes

The first question related to workstation size was:

Does a good furniture system result in less sq ft per workstation?

Table 2.6 Effect of system furniture on workstation size

<u>Response</u>	<u>No.</u>	<u>%</u>
No	6	(32)
Somewhat	4	(21)
Yes	9	(47)
	19	

The average square footage of workstations are given below. These figures also reflect the status hierarchy in organizations. Very few respondents were able to provide detailed information on workstations with VDT's. These data were not readily available.

Table 2.7 Workstation sizes (sq ft)

<u>Job category</u>	<u>W/out VDT</u>	<u>With VDT</u>
Managerial	132.6 (N=19)	150 (N=3)
Professional	100.8 (N=18)	122 (N=3)
Technical	83.4 (N=16)	121 (N=4)
Clerical	60 (N=16)	119 (N=4)

2.5.3 Workstation Location

Functional requirements (N=12) and adjacencies (N=10) are the major reasons for locational decisions. Added features noted were the building grid, in-floor electrical and telecommunications access and having common areas in the building core.

2.6 Office Types

While most of the offices examined employed open-space designs, there was also some use of other types of spaces.

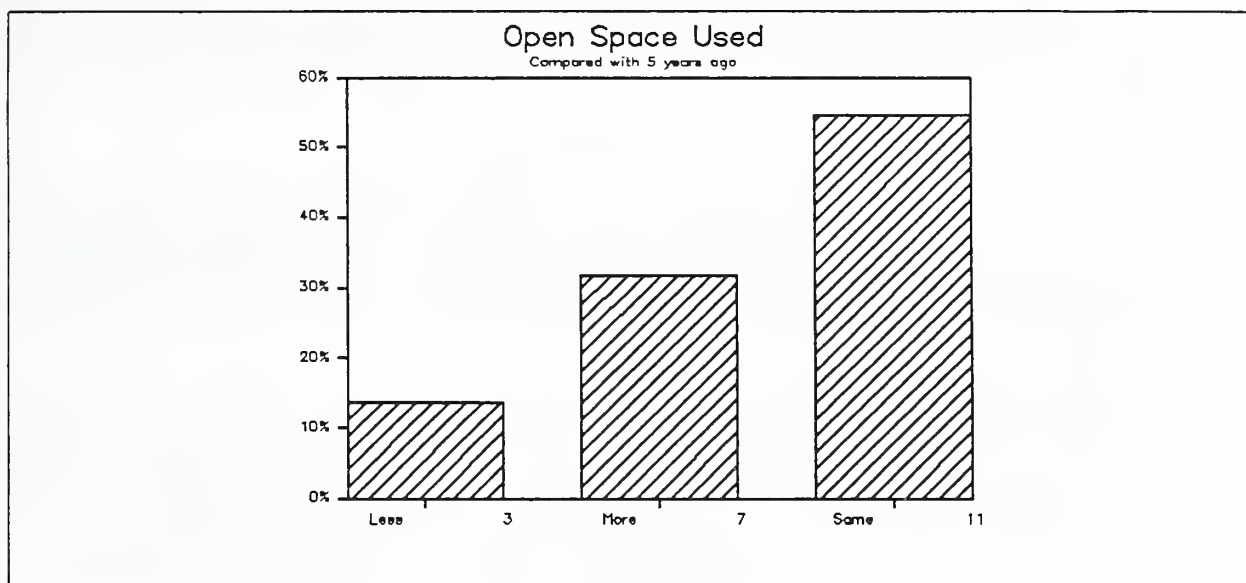
First, open space usage was explored; first the trends will be discussed.

With respect to open space, how much is used now compared with 5 years ago?

Table 2.8 Open space usage compared with 5 yrs ago

Rating	Number	Percentage
Less	3	13.6
More	7	31.8
Same	12	54.6
	22	

Figure 2.6 Open space usage



How much open space planning used today? - The average of all responses was 47.6%.

The next series of items dealt with the benefits and shortcomings of various office designs. The first one examined was that of open-offices.

2.6.1 Open-office designs - benefits.

The primary benefit of open-office was judged to be flexibility, although better communication, reduced initial construction cost and better space use were also prominently mentioned. Below are other factors cited more than once.

- * Flexibility (12)
- * Facilitate interaction/communication (7)
- * Reduced initial construction cost (6)
- * Better space use/higher densities (6)
- * Short knockdown and reconstruction time (3)
- * Decreased workstation size (2)
- * Better lighting (2)
- * Ability to group people for specific project (2)

A variety of other reasons were mentioned, related to design, personal issues and functional ones. The design factors were vertical storage at workstations, good power and cabling, better HVAC systems. Personal preferences included feeling of airiness, visual interest, open feeling and outside awareness. Finally, better telephone coverage and improved circulation patterns were noted.

2.6.2 Open office designs - disadvantages

The lack of acoustical and visual privacy, and noise disruptions were the predominant drawbacks identified with open-offices.

- * No privacy (acoustical and/or visual) (13)
- * Noisy (9)
- * Noisy, no privacy (4)
- * Distractions (2)
- * Perceived status loss (2)

Other features mentioned as problems were standardized furnishings, difficult housekeeping and maintenance, need to inventory many items, replacement costs of systems furniture.

2.6.3 Private offices - benefits

As anticipated, the major benefits of the private office were improved privacy and status enhancement.

- * Privacy and status (8)
- * Privacy (4)
- * Good acoustics (4)
- * Privacy, security (2)

Additional factors noted were better control of the work environment, quiet, feeling of permanence, ability to customize furnishings and improve staff interactions by facilitating confidential discussions.

2.6.4 Private offices - Disadvantages

Lack of flexibility, cost and isolation were noted as the primary disadvantages of private offices.

- * Lack of flexibility, cost (8)
- * Isolation (3)

Longer construction time, more space, inefficient space utilization, difficult to reconfigure, higher electrical and HVAC costs were among other shortcomings identified.

In the case of semi-private offices, few specific advantages or disadvantages were mentioned. There were too few responses to these questions for any general conclusions to be drawn.

2.6.5 Status and workstation type

Next, the relationship of status and type of space was explored, using the following question:

What is the percentage of the following in open, semi-private, and private offices? (For Managers, Professionals, Technical, Clerical.)

Almost all respondents uniquely answered this question; the only consistent finding was that more clerical and technical personnel were assigned to open spaces than professionals or managers. Any other result would have been surprising.

2.7 Status

The next series of questions dealt with the design implications of organizational status. The first topic concerned how status was accommodated. While the findings below show different combinations of factors, those of size, furnishings, and private offices issues were most evident. Others mentioned were furniture finishes and locations.

- * Size, furnishings (6)
- * Furniture type, finish (3)
- * Private office (3)
- * Private office, workstation location (2)
- * Size, location (2)
- * Standards (2)

Responses as to how status affects design decisions and layout were quite varied; ranging from 'little to none'(5) to forming the basis for floor plans. Among the general observations were:

- * Must consider in layout (2)
- * More remodeling
- * Makes design challenging (difficult)
- * Requires accommodation of some private offices
- * Better locations for higher managers

More specific concerns were:

- * Window adjacencies, use of corners (2)
- * More office conference functions

When asked:

What if any, changes have been made in accommodating status in the past 5 years?

Twelve responses were 'none'; other replies noted that fewer professionals and lower level managers had private offices, office sizes were being standardized, and more wood is being used to compensate for less space.

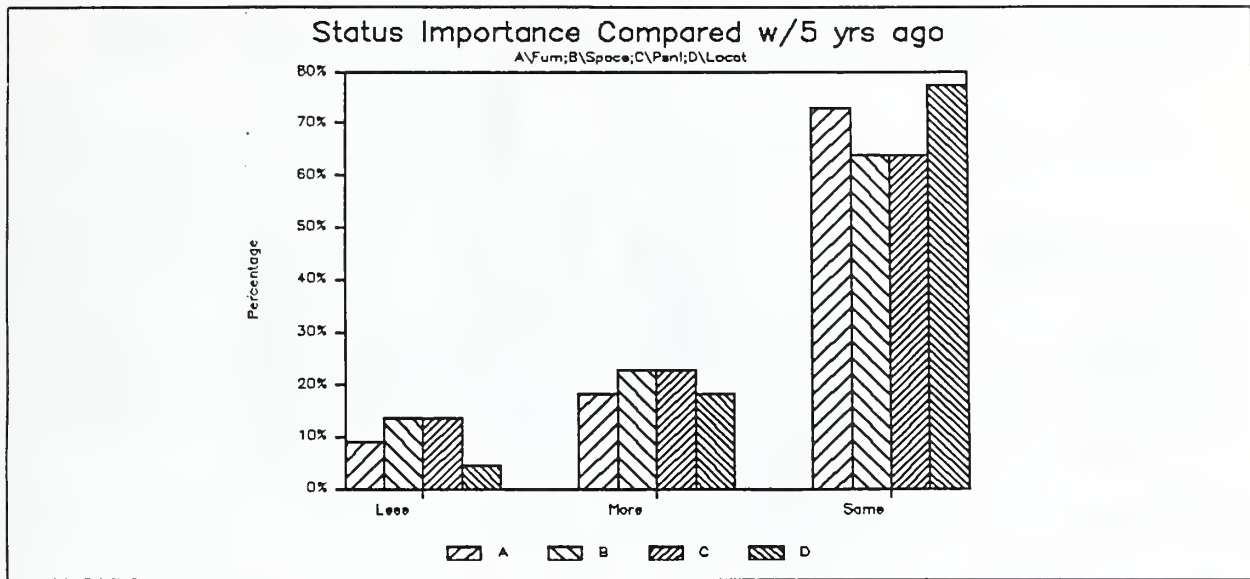
2.7.1 Status Symbols

The next group of items concerns how organizational status is reflected in design decisions today as compared with 5 years ago. On balance, all of the features examined receive somewhat more consideration now than formerly.

Table 2.9 Status Features

Features	Fig Code	Less		More		Same		(N=22)
		#	%	#	%	#	%	
Furnishings	A	2	(09)	4	(18)	16	(7)	
Space	B	3	(14)	5	(23)	14	(63)	
Personalization	C	3	(14)	5	(23)	14	(63)	
Location	D	1	(05)	4	(18)	17	(77)	

Figure 2.7 Organizational status indicators



The next item addressed the need to accommodate change.

How do you plan for expansion or changes in configuration or size as needs change?

A modular concept, standard grid and access floors were the predominant approaches cited. Others noted the importance of planning for expansion space, employing five year forecasts. Movable partitions and design with a spline system were also mentioned, as was the philosophy 'move people, not cubicles'.

In planning for expansion or changes in configuration or size as needs change the responses varied from general strategies to selecting particular design options. Strategies included employing expansion spaces designed for a five year period (3) and analyzing historical data to project growth (2). Specific recommendations included:

- Modular concept, standard grid (6)
- Use access floor (4)
- Expansion space designed for 5 year period (3)
- Open plan; easy rearrangement (2)
- Organizational planning projections, historical data
- Seldom can build-in expansion; accommodate with movable partitions and systems
- Move people, not cubicles
- Design based on spline system
- Balance kinds and locations of offices
- Add rooms or storage as needed

Table 2.10. Planning/expansion factor priorities

Importance of following in planning for expansion or change
(1=most important; 5= least important).

Variable	1		2		3		4		5	
	#	%	#	%	#	%	#	%	#	%
Sq ft wkstat	13	(59)	3	(14)	2	(09)	2	(09)	2	(09)
Type of work	5	(23)	8	(36)	6	(27)	3	(14)		
Status	3	(18)	3	(18)	5	(29)	3	(18)	3	(18)
Eqmt amount	7	(32)	6	(27)	4	(18)	4	(18)	1	(05)
Computer	3	(14)	8	(38)	5	(23)	1	(05)	4	(19)
Storage space	3	(20)	4	(23)	8	(53)	1	(02)	1	(02)
Variety	1	(06)	2	(11)	5	(28)	3	(17)	7	(39)
Uniformity	3	(18)	6	(34)	4	(24)	4	(24)		

Variable	Figure	Code
Sq ft wkstat	2.8	A
Type of work	2.8	B
Status	2.8	C
Eqmt amount	2.8	D
Computer	2.9	A
Storage space	2.9	B
Variety	2.9	C
Uniformity	2.9	D

Figure 2.8 Planning for change (1)

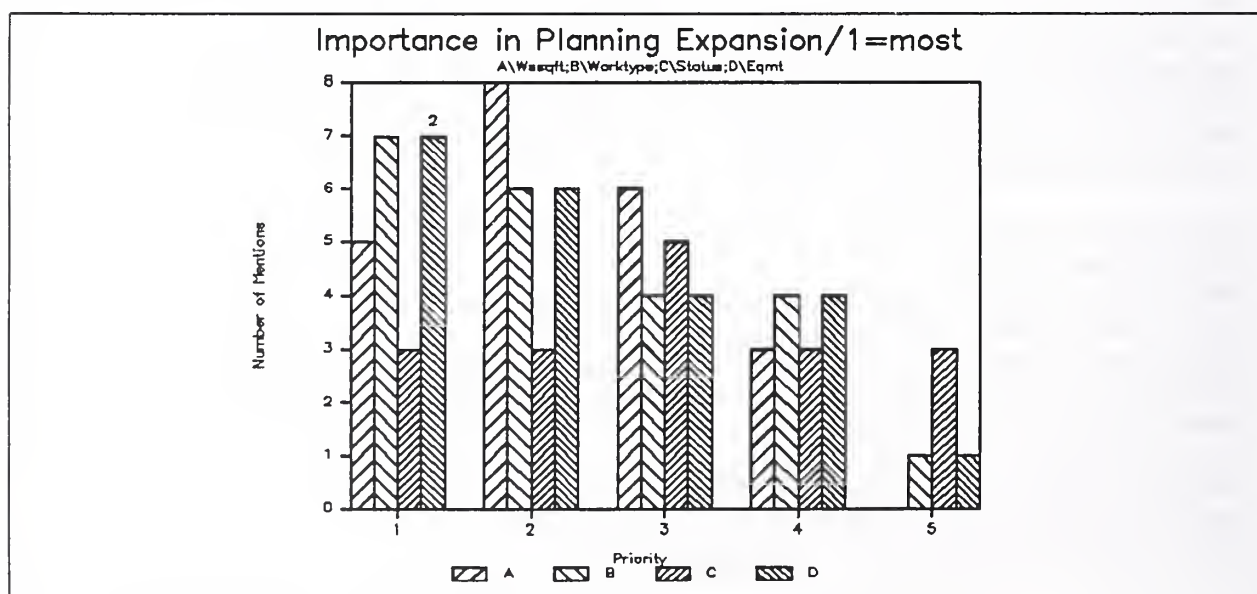
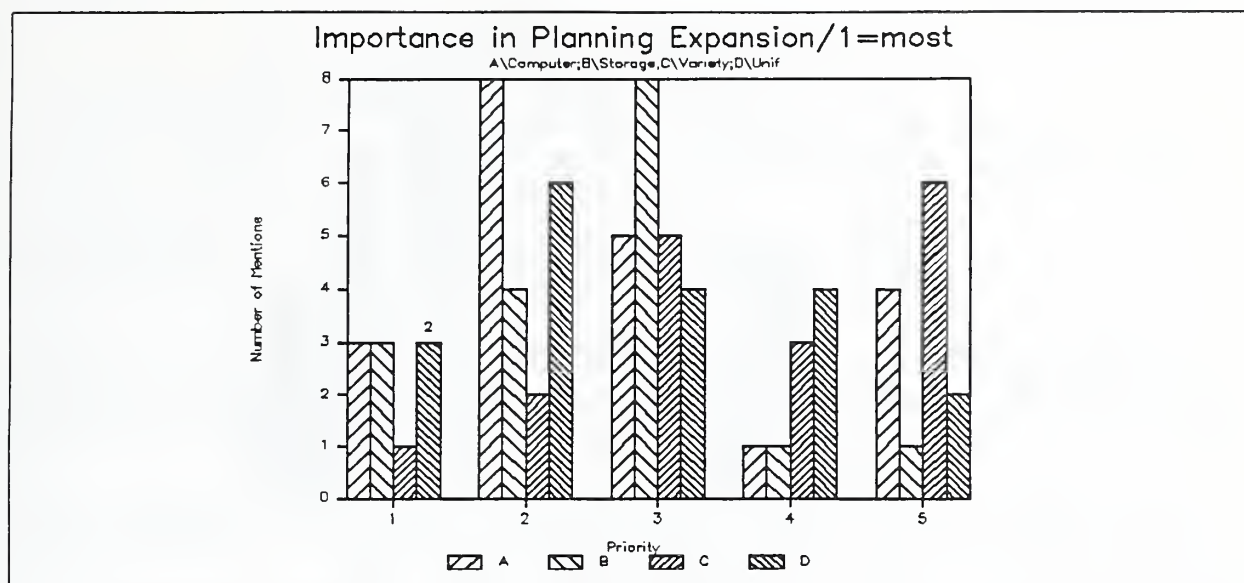


Figure 2.9 Planning for change (2)



Respondents were then asked how the individual workstation needs are determined. Interviews were used by 19 of 22 organizations, while questionnaire surveys were employed by 12 of the 15 firms answering this item.

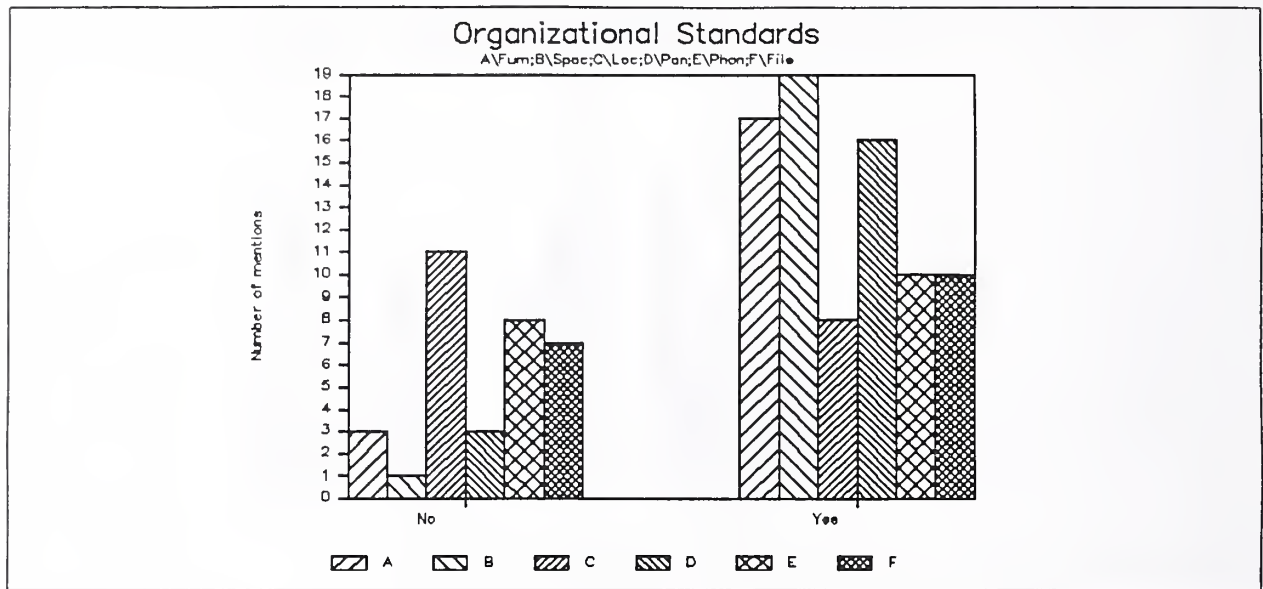
2.8 Corporate Design Standards

The next topic of inquiry was the existence of organizational standards for workstation and office features. Twenty of 22 respondents had standard workstation designs. 'Space', 'furnishings' and 'panel attributes' were the most frequently mentioned standard features. However, as with many of the other characteristics examined, considerable variability existed among the organizations examined.

Table 2.11 Organizational Standards

Design Feature	Figure Code	Yes		No		Total
		#	%	#	%	
Furnishings	A	17	(85)	3	(15)	20
Space	B	19	(95)	1	(05)	20
Location	C	8	(42)	11	(58)	19
Panel Ht, Color	D	16	(84)	3	(16)	19
Phone systems	E	10	(56)	8	(44)	18
Files	F	10	(59)	7	(41)	17

Figure 2.10 Organizational standards



The next item explored the development of standards.

In developing workstation design standards, how did you arrive at the number, size, and designs used?

Past experience (8) was the most prominently mentioned approach, while surveys and other formal data collection procedures such as interviews were also common (6); the latter was often done in conjunction with consultants. Other approaches were trial and error, and past corporate standards. Equipment needs, building constraints and component configurations were also factors in determining final designs.

2.9 Design and Productivity

A major goal for many organizations is the enhancement of productivity through office design. Identifying means of accomplishing this goal has been elusive to researchers and practitioners. The next questions are intended to deal with this topic indirectly, by eliciting opinions from designers concerning design and productivity.

The first question was:

What qualities should workstation have to enhance productivity?

As might be expected, the responses covered issues ranging from meeting the desires of occupants, to accommodating functional needs. Other respondents were skeptical about any direct relationship between design and productivity. Privacy, adequate lighting and acoustics, storage, ergonomic design and meeting

functional requirements were mentioned often. Sample comments follow:

- * Quality alone will not enhance productivity
- * The occupant should like his/her space
- * Sufficient space to perform tasks, personal privacy
- * Noise control, equipment space, adequate light, storage and work surface, chair comfort
- * Ergonomic design, proper adjacencies
- * Appearance, lighting, acoustics, color, texture
- * Communications and lighting flexibility

Fifteen of the 22 responses indicated that they solicit user input to improving productivity through design. Information is obtained through personal interviews, surveys conducted in-house and by consultants.

With respect to the particular design features that have contributed to improved productivity, the following were noted:

- * Minimum workstation size, standards, white sound to mask noise
- * Panel heights according to function
- * Systems furniture, parabolic light, task lights
- * Standards for personal objects
- * Post Occupancy Evaluations (POE)
- * Overhead storage
- * Modular furniture
- * Providing adequate size, configuration, good lighting, ventilation and heating

Of the 22 respondents, 13 did not know whether productivity was enhanced by design and 9 believed that it was. No details were provided as to how productivity was measured or assessed, although this question was asked.

Another question related to productivity was:

Have technologies enhanced productivity?

Thirteen respondents indicated that computers have enhanced productivity, while 7 responded that they did not know whether productivity was enhanced.

2.10 Workstation design features

Twenty of the 22 respondents used standardized workstation designs, but the number employed and the configurations differed considerably among organizations.

The next question was intended to prioritize key workstation attributes. Respondents were asked to rate the importance of a variety of workstation features on scale of 1-5, with 1 being the most important one.

Table 2.12 Importance of workstation features

Workstation Feature	Importance (1=most)										
	1			2		3		4		5	
	Tot	#	%	#	%	#	%	#	%	#	%
Visual privacy	20	6	(30)	5	(25)	6	(30)	2	(10)	1	(05)
Acoustic priv	22	10	(45)	5	(23)	3	(14)	3	(14)	1	(05)
Ind Env cont	19	4	(21)	2	(11)	4	(21)	4	(21)	5	(26)
Flexibility	20	7	(35)	6	(30)	4	(20)	1	(05)	2	(10)
Standards	20	4	(20)	5	(25)	4	(20)	5	(25)	2	(10)
Working space	22	11	(50)	5	(23)	2	(09)	2	(09)	2	(09)
Lighting	21	7	(33)	6	(29)	7	(33)	1	(05)	0	(00)
Daylight acs	18	1	(06)	6	(33)	7	(39)	1	(06)	3	(17)
Indoor Air Qty	20	5	(25)	8	(40)	3	(15)	0	(00)	4	(20)

Workstation Feature	Figure	Code
Visual privacy	2.11	A
Acoustic priv	2.11	B
Ind Env cont	2.11	C
Flexibility	2.11	D
Standards	2.11	E
Working space	2.12	A
Lighting	2.12	B
Daylight acs	2.12	C
Indoor Air Qty	2.12	D

Figure 2.11 Workstation feature importance (1)

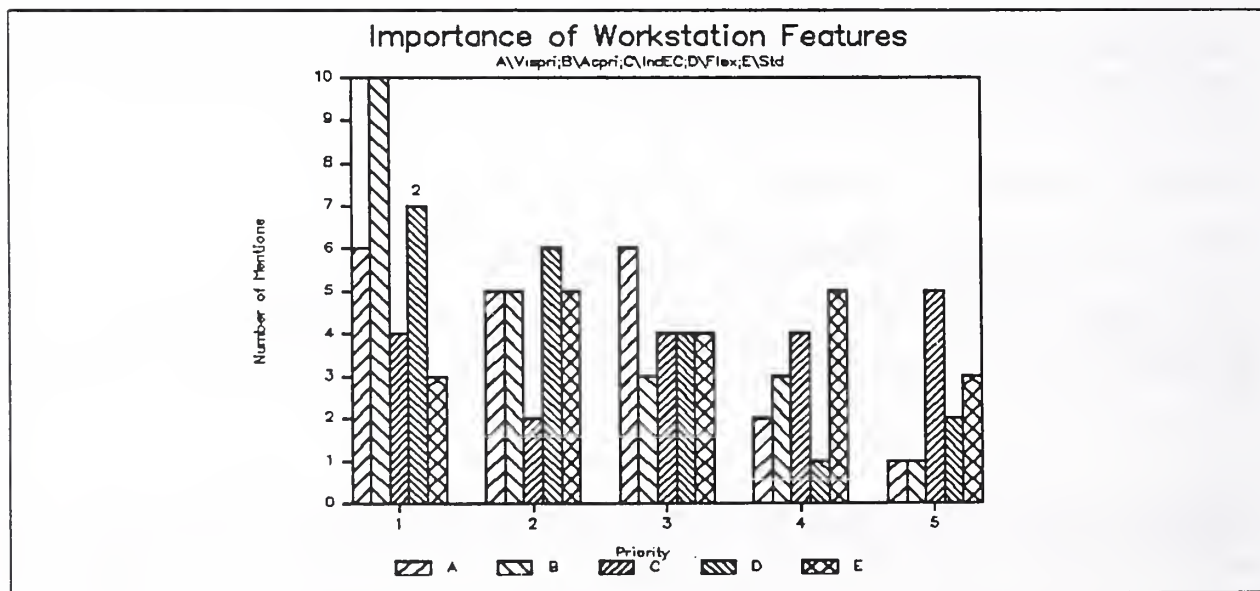
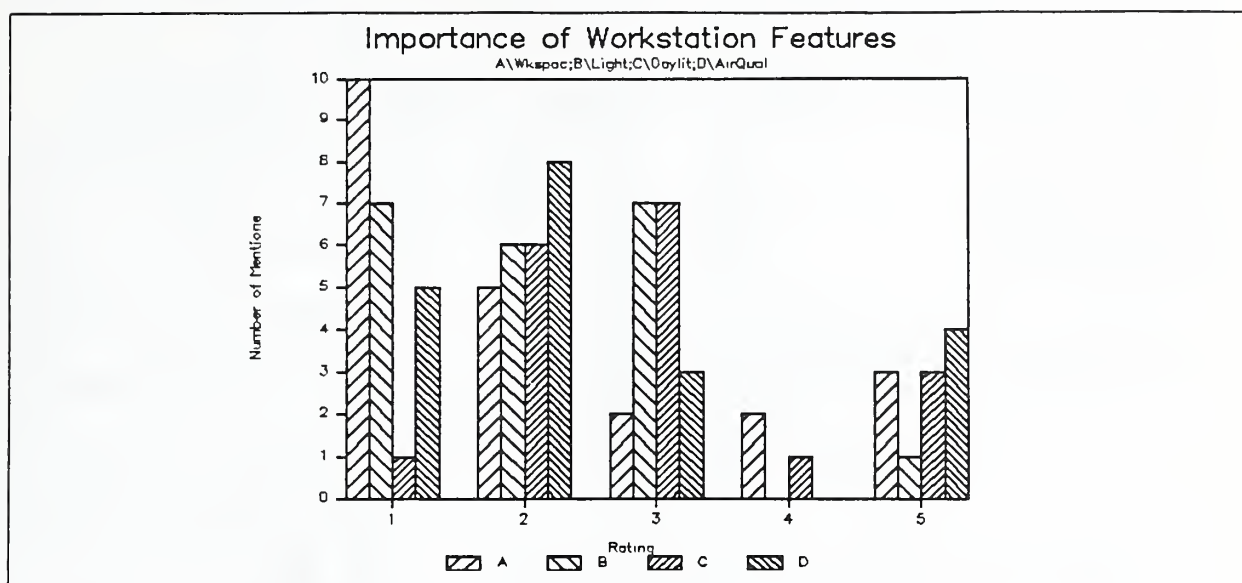


Figure 2.12 Workstation feature importance (2)



Sufficient and appropriate working space and acoustic privacy were cited as the most important features, but lighting, flexibility, visual privacy and air quality were also quite important as indicated by the combined scores of 1 and 2.

2.11 Technology and Design

The next topic explored was the effect of technology on design.

In general, how has technology influenced design?

Five respondents indicated that technology has had little design impact. Other responses were:

The VDT-based workstation has had a profound influence according to most people. It requires more space than conventional desks (5) and the flexibility to rapidly upgrade as improved technology is developed and introduced into the office (3). Wiring requirements have increased (3) due to voice, data, and electrical system needs and changes. Finally, it is more important than previously that HVAC and lighting systems be responsive to individual users and working groups, e.g. zoned.

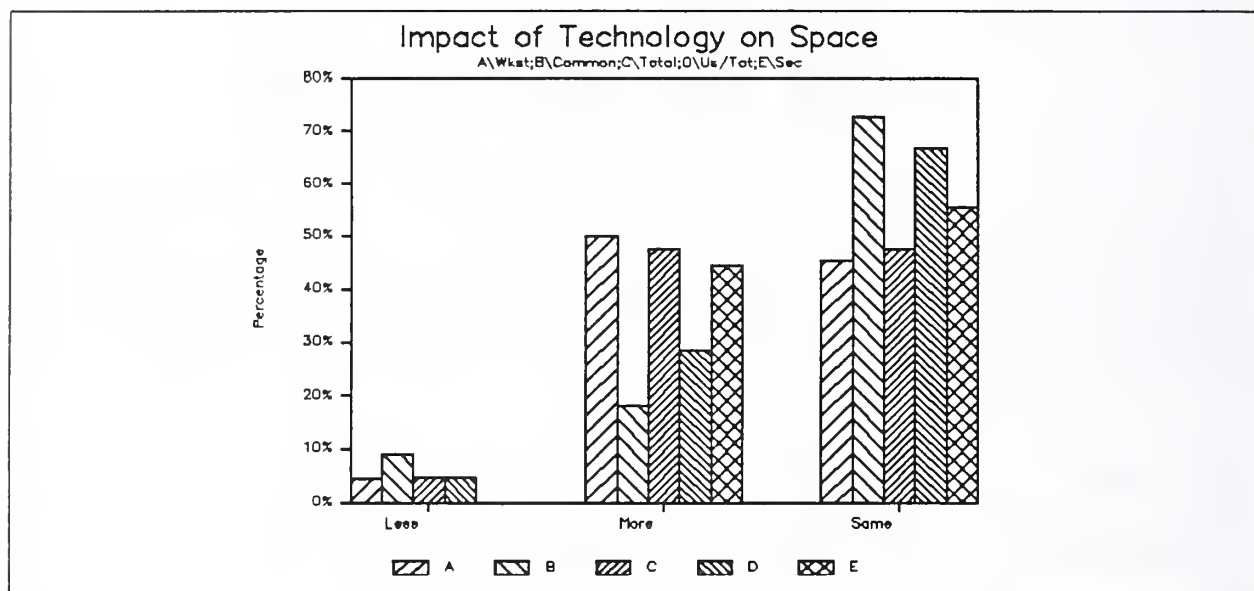
The relationship of technology on space usage was then examined.

What has been the impact of technology on the following spaces?

Table 2.13 Impact of technology on space usage.

Space Feature	Less		More		Same		Total N
	#	%	#	%	#	%	
Workstation	1	(05)	11	(50)	10	(45)	22
Common spaces	2	(09)	4	(18)	16	(72)	22
Total space	1	(05)	10	(48)	10	(48)	21
Usable/total	1	(05)	6	(29)	14	(67)	21
Security			8	(42)	11	(58)	19

Figure 2.13 Technology and space usage



Our findings suggest that technology has increased the needs for space for most of the organizations questioned in one or more of the categories examined. Only rarely did technology result in the use of less space.

The next item was directed toward better defining the specific technologies that influenced design.

What specific technologies have influenced design; how?

The presence of computers in offices has had the greatest design influence (11). Among the design factors affected by their use, the following were cited: more space, larger workstations, indirect and task lighting, furniture, type of storage.

Other technologies mentioned were:

- * New wire management - increased power requirements, need for clean power, flat wire, twisted pair wire technology, voice and data distribution, carpet tile eases electrical access, access floor
- * Technology rooms for computers
- * New paper management systems

The next question was:

How have you accommodated these technologies?

The responses to this item were quite varied, and included:

- * Reconfiguring and retrofitting furniture (2)
- * Providing ample space for VDTs & good lighting
- * Changing office furniture
- * More computers
- * Stand alone and other systems accommodated in same space
- * Everyone has a pc at the workstation
- * Each station is wired with four pair wire
- * Buying new furniture for VDTs

2.12 Planning for changes

An important factor in planning for change is the "churn rate" (the percentage of staff members moving per year). The average was 20.5.

The next question addressed how workstation changes are planned.

How do you provide for change of function, furniture arrangement, equipment, within a workstation?

Most respondents (17) indicated that they used systems modular furniture to provide for changes within workstations. The specific mentions were as follows:

- * Modular furniture (6)
- * Rearrange components (5)
- * Built in workstation flexibility (4)
- * Different work surface heights
- * Furniture guidelines

Changes frequently entail adding capabilities, and this was the topic next addressed.

How do you provide for growth (materials storage, added equipment) within each workstation?

In providing for growth within a workstation, a variety of approaches were noted:

- * Add storage units (5)
- * Keep storage away from work area (2)
- * Add vertical components to workstation (2)
- * Keep 10% of the space open
- * Encourage cleanup every two years
- * Provide adequate space at outset for expansion
- * Modular systems that don't go out of date
- * Reconfiguration

2.13 Telecommunication

The next series of questions concerned changes in telecommunication systems, a key requirement in high technology offices. Changes in the telephone system were accomplished by software for 16 of the 21 firms responding.

The next series of questions dealt with the need to change wires while making changes. The findings varied considerably from organization to organization.

How often do you replace telephone wire when moving?

- * Never (7)
- * Seldom (4)
- * Always (3)
- * Often (2)
- * Depends on facility

How often do you add new data wires?

- * Sometimes (5)
- * Always (2)
- * Often (2)
- * Depends on facility
- * Never

How often do you change data wires because of a move?

- * Never (9)
- * Seldom (3)
- * Often (2)
- * Depends on facility
- * Always

2.14 Environmental Issues

Environmental issues were then touched upon as they related to systems furniture and technology.

What are environmental problems associated with incorporating new technology into open offices with/without systems furniture, e.g. air quality, lighting, etc.

New office technologies have introduced a range of environmental problems into the office. With respect to lighting, glare from overhead fixtures and windows (4) and task lighting for VDT's (3) were noted. As for acoustics, noisy equipment (4) acoustic privacy (4) caused the most difficulties. Thermal comfort (5) is compromised by the heat produced from equipment, and the lack of proper zoning for thermostatic control. Finally, proper air flow and air balancing between offices also contributes to thermal discomfort.

The next question dealt with environmental control strategies.

Any difference in environmental control strategies needed as a result of new technologies and open plan?

To better control the thermal environment different HVAC systems were proposed (4); e.g. greater use of flexible HVAC, modular heat pump, increase air handling capabilities. Special non-glare lighting systems and task lighting were recommended to deal with lighting complaints.

2.14.1 Acoustics

The next question concerned the acoustic environment.

How do you control noise within the work environment?

The responses included methods of limiting sound, absorbing it, impeding its movement, and producing sound masking. A summary of these findings follows:

- * Electronic sound masking (7)
- * Carpets (7)
- * Acoustic absorbent surfaces (6)
- * Acoustic panels (5)
- * Acoustical ceiling panels (3)
- * Layout configurations (3)
- * Private offices (2)
- * Management policies on conversation levels
- * Insulate walls in private office
- * Isolate printers and other noisy equipment
- * Printer covers

2.14.2 Lighting

Lighting was the next environmental feature addressed.

How do you determine lighting requirements and kind of light provided in each work area - ambient and individual?

Few respondents indicated how they established lighting requirements, e.g. functional evaluation (2). Instead, lighting design approaches were noted. Task/ambient systems (8) were the most popular method employed. Other responses were, IES recommendations, foot-candle levels (which varied for each organization), meeting code requirements and finally, by area not function. Company standards were also noted (4). (See Appendix for detailed responses.)

2.15 Electrical Requirements.

The first topic considered was the basis for workstation electrical requirements.

What is the basis for determining electrical requirements for each workstation?

Functional evaluations (8) were the most popular means for specifying workstation electrical requirements, followed by historical usage with some added capacity (4). Other methods employed were standards and guidelines (3), square footage wattage allowance, code requirements, and equipment needs. (See Appendix for detailed responses.)

The design approaches to accommodating electrical systems were then explored.

How is change in electrical requirements accommodated?

Changes in electrical requirements were accommodated by projecting space needs (2), adding circuits when needed (2) and establishing guidelines and standards during early planning (2). Other responses were:

- * Provide building systems flexibility
- * Maintain buffer space between organizations
- * Provide main service sizing only
- * Provide expansion space within
- * Extra outlets
- * Equipment selection based on available capabilities and ease of installation

The final question about electrical systems dealt with bringing power to the workstation.

How do you accommodate growing use of electrical technologies in furniture wiring, the office and the workstation itself?

Access floors were the most popular approach (5) while powered panels were used by some (2) and rejected by others (3). An intermediate approach employing raceways in panels was favored by two respondents. Other responses called for prewired furniture (2), plug-in systems, trays and fiber optics. (See Appendix for more complete findings.)

2.16 Office Furniture Systems

The next topic addressed was the use of office furniture systems. Twenty-one of the 22 firms surveyed used them. The reasons for this choice was first explored.

If you use office furniture systems, why did you make this choice?

Flexibility (9) and cost effectiveness (3) were chosen most often as reasons for selecting systems furniture. Upgrading the furniture standard, executive decision and local usage, each were cited by two respondents. The remaining responses were:

- * Price and quality of design and materials
- * Ergonomics
- * Efficiency, privacy
- * Competitive bid situation
- * Better use of space

Table 2.14 Priorities for furniture selection (1=highest)

Criteria	1	2	3	4	5	6	7	8	Total
Large selection	6	2	1	2	1	1		1	14
Cost	7	2	1	1	2	1	1	1	16
Ease of change	5	7	2			1	1		16
Finish choices	1	3	1		1		2	5	13
Durability	4	3	3		3		1	1	15
Elec connect feat	2	3	4	2	2	1	2		16
Maintainability	3	2	2	3		4		1	15
Appearance	1	6	1	3	1	2	1		15

Figure 2.14 Priorities for furniture selection (1)

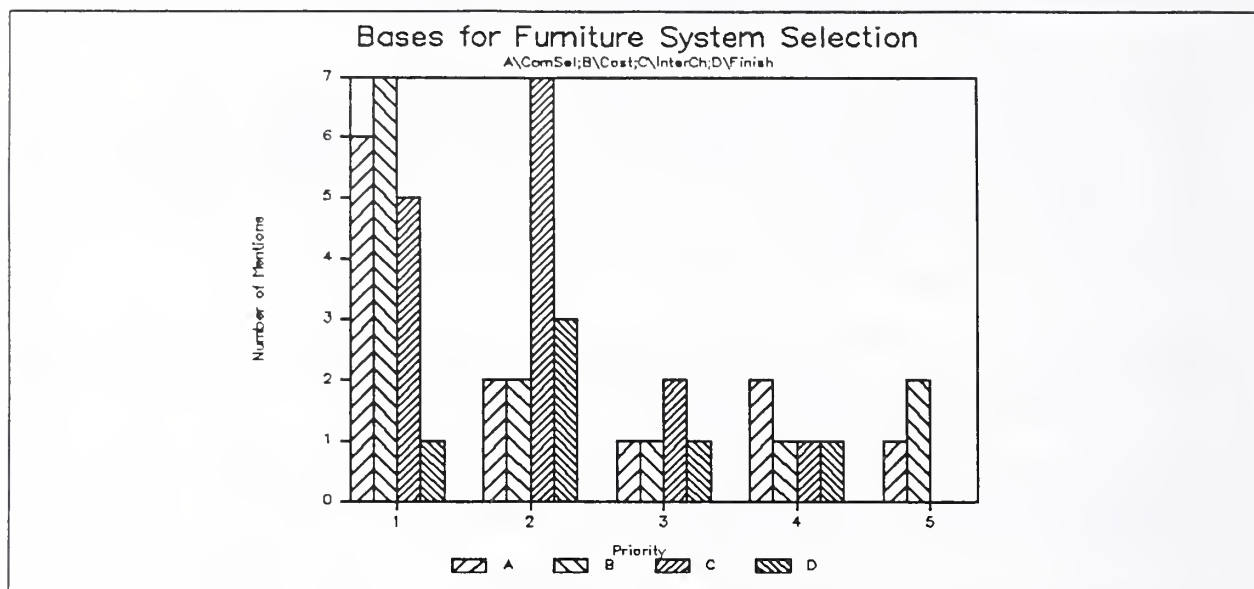
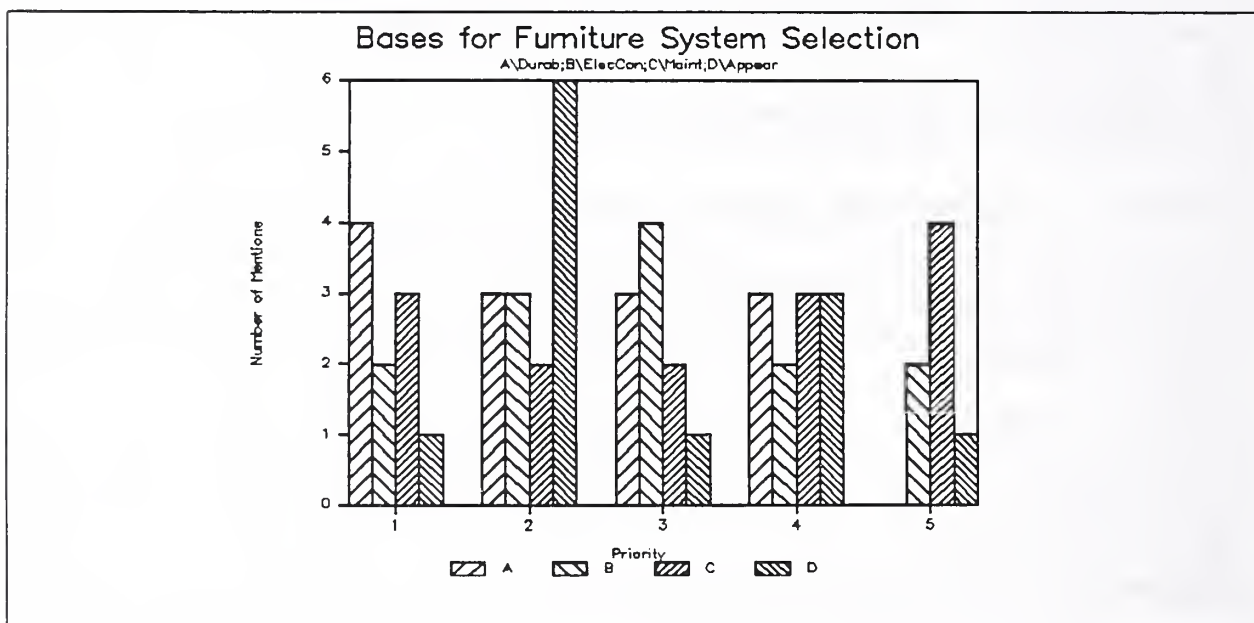


Figure 2.15 Priorities for furniture selection (2)



The next item was designed to determine whether there has been a change in the rationale for system furniture selection.

Have the bases for systems furniture selection changed in the past 5 years, if so, how?

Most respondents (14) indicated that the reasons for furniture selection have not changed much. Those that noted changes mentioned the following:

- * Less emphasis on first cost and more on quality and flexibility.
- * Work surface adjustments are becoming more important.
- * More components are needed.
- * Restrict the number of different systems purchased.

Another item addressed how office functions affect design decisions compared with 5 years ago. Nine responses noted a greater importance, while 12 indicated no change.

The next inquiry concerned the degree of personalization permitted by individual workers in the furnishings and configuration of the workstation.

Does the user have choices in colors, arrangement, type of furniture; what are they?

Choices by users were quite limited in most instances; usually dependent on functional needs. Organizational standards predominated. (See Appendix A for detailed responses.)

Since a primary reason for purchasing systems furniture is its flexibility, an important concern is how necessary changes are made. This issue was considered next. First, who makes the changes, and then how difficult such changes are to accomplish.

Who makes changes in systems furniture?

Most changes in systems furniture were made by one or more of the following: maintenance personnel, contractor, operations and furniture manufacturers. The table below indicates the number of respondents using one or a combination of these resources:

Table 2.15 Responsible party in changing system furniture

Maintenance	Contractor	Operations	Furn Dlr	Other
5				
	4			
3	3			
1		1		
1		1		
1		1		a
			2	
1				b
		1		c
1	1	1		
		1		

a- Facility planners

b- Engr & construction department

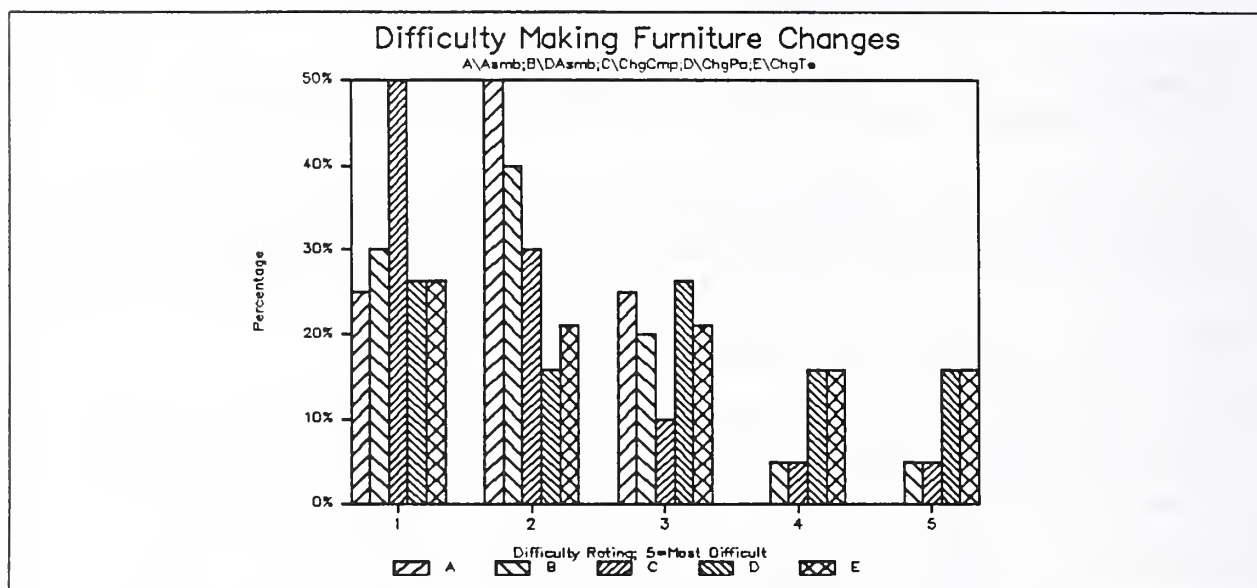
c- Management

The next question explored the difficulty in making modifications to accommodate changes. Making changes in power and telecommunications appeared to provide the greatest difficulties.

Table 2.16 Difficulty changing furnishings (5= most difficult)

	Total	1		2		3		4		5	
		#	%	#	%	#	%	#	%	#	%
Assembly	20	5	(25)	10	(50)	5	(25)				
Disassembly	20	6	(30)	8	(40)	4	(20)	1	(05)	1	(05)
Add/change	20	10	(50)	6	(30)	2	(10)	1	(05)	1	(05)
Add/ch power	19	5	(26)	3	(16)	5	(26)	3	(16)	3	(16)
Add/ch tele	19	5	(26)	4	(21)	4	(21)	3	(16)	3	(16)

Figure 2.16 Difficulty in changing furnishings



In response to whether a supply and maintenance contract was negotiated, 10 organizations had one and 7 didn't.

2.17 Summary Issues

2.17.1 Defining User Requirements

The following items address the general question:

Based on your experience, with respect to the following, what factors are most important in defining user requirements?

As for systems furniture, flexibility (9) was most important, followed by cost (3) and aesthetics (3). Meeting job requirements, panel heights, colors and component selection were each cited twice. Among the additional factors mentioned were:

durability, maintenance, file space, work surface, workspace height and electrical capabilities.

The next item addressed workstation space needs. Meeting user needs (5) and sizing correctly for function (5) and storage (4) received the most attention. Housing equipment (3) and status (2) received multiple mentions, while standardization, flexibility, seating and accommodating visitors were also noted.

A quality workplace included good lighting (5), acoustical privacy (5) and appearance (3). Other factors noted were personal space, air quality, adequate space, furniture, seating, thermal comfort, visual privacy, location and facilitating job functions.

In employing new technologies, flexibility was the most popular response (4) and often dealt with electrical and communication systems; e.g. the use of an access floor, sufficient wiring raceways and electrical capacities, rewiring for voice and data communications. Planning and keeping current with new developments were also suggested, as were standards. Finally, ergonomics, employee acceptance, and user control of lighting and air conditioning systems were mentioned.

2.17.2 The Design Process

Tradeoffs in making design decisions were then identified. The most important ones concerned cost vs: aesthetics, delivery time, lighting, acoustics, flexibility, office size, etc. Other tradeoffs mentioned were:

- * Size for 'need' rather than 'want'
- * Zone control of A/C vs individual controls
- * Appearance vs flexibility
- * Space available vs required

Conflicts among tradeoffs were resolved by management review, corporate policy and negotiation with occupants. Costs often prevail in economic analysis when applied against function. Life cycle costs was then explored; it was used by 12 of the 20 respondents. For those employing life cycle cost analysis, it affected planning/design proposals in several ways:

- * It drives basic system selection
- * It eliminates a more expensive first cost decision
- * Building subsystems were often selected on this basis
- * Operating costs & maintenance costs effect design decisions
- * Products selected based on value

2.17.3 Evaluations of Results

Respondents were then asked whether they obtain information about completed projects. Evaluations of design solutions included occupant feedback (9), formal Post Occupancy Evaluation (POE) studies (3), complaint data (3) and engineering analyses (2).

Other methods were visits, living with the design, and comparisons with similar facilities. Nineteen of the 20 respondents visited completed projects.

2.17.4 Feedback Into New Projects

The next item dealt with the feedback process of using evaluations in follow on work. The question posed was:

How do you use the experience of previous projects to improve your present and future planning and design efforts?

Reviewing the design process and the results (3) and formal evaluations (3) were employed to improve design planning efforts. These reviews led to modifications of the design assumptions and criteria (2). The object of these critiques was to streamline the process, apply what works, avoid mistakes, and document problems.

2.18 Factors Influencing Office Upgrading

The next question concerned the factors which contribute to decisions to update office facilities. Respondents were asked to identify the 3-5 most important factors influencing such decisions in the next 5 years.

Table 2.17 Factors influencing office upgrading

Factor	Yes		No		Total
	#	%	#	%	
Improve quality of work life	15	(71)	6	(29)	21
Increase flexibility	14	(67)	7	(33)	21
Company reorganization	13	(62)	8	(38)	20
Flexibility-added work zones	12	(57)	9	(43)	21
Increase productivity	11	(52)	10	(48)	21
Growth	11	(52)	10	(48)	21
New technology	10	(48)	11	(52)	21
More workers	9	(45)	11	(55)	20
Better communications	9	(43)	12	(57)	21
Upgrade appearance	9	(43)	12	(57)	21
Improve work conditions	7	(33)	14	(67)	21
More worker control	6	(29)	15	(71)	21
Increased construction cost	6	(29)	15	(71)	21
Renovation	6	(29)	15	(71)	21
Energy costs	5	(24)	16	(76)	21
High rentals	5	(24)	16	(76)	21
Fewer workers	4	(19)	17	(81)	21
Organization relocation	4	(19)	17	(81)	21
More worker space	3	(14)	18	(86)	21
More accessible storage	3	(14)	18	(86)	21
Corporate image	3	(14)	18	(86)	21
Increased HVAC cost	2	(10)	19	(90)	21
Use new systems	2	(10)	19	(90)	21
Tax depreciation	1	(05)	20	(95)	21
Higher lighting costs			21	(100)	21

2.19 Lessons Learned

Sixteen of the 17 respondents reported that the use of systems furniture and open-office design resulted in an improved office environment. As for space reduction, 13 indicated none, while 3 noted that there was some.

As a summary question, respondents were asked:

What would be done differently next time?

Most respondents noted the significance of minimizing choices and standardizing on a limited number of them, e.g. office sizes, workstations, panel sizes and colors. In addition, the use of a single furniture manufacturer with stable production and available spare parts was recommended. The wall system should accommodate a range of simplified system components. Finally, the importance of adequate shelf space and seating were noted.

The importance of experience with systems furniture by the architect planning the space was stressed. Another suggestion was to have offices around the interior core since perimeter offices block exterior view for most people.

Heavy electrical use is expected. Access floor for cabling to work space, prewiring of building, flexible light, data and power distribution, prewired workstations were other factors cited.

With respect to designing for flexibility, several approaches were described to facilitate change. A simple open plan system based on a grid, rather than custom design was recommended. Increased aisle width facilitates movement. Additional conference areas are useful; convertible to later staff needs. This provides built-in space for immediate usage. Other suggestions were:

- * Build on past experience each time
- * Use design professionals to plan
- * Allow for more space
- * A spline system was recommended by some, with utilities in a common spline with movable wing walls.
- * Plan for more wiring/communication distribution up front
- * Maintain good standards, do not rely solely on low bidder.
- * Standardize on few office sizes, systems furniture and components for all workstations.
- * The number of fixed walls should be minimized.
- * Relocatable workstations, with more full height movable walls have proven effective in some instances.
- * Consider task lighting with ambient
- * Provide more capability for computers

3. Summary and Conclusions

Architects and facility managers of 22 large organizations responded to a detailed questionnaire survey concerning the effects of new technologies on office design and use. Most respondents had broad design and facility management responsibilities for their organizations. The survey dealt with many diverse issues, ranging from design process concerns, to workstation configurations and the possible effects of design on worker productivity.

In automating offices, a major objective is to achieve a "high quality workplace". When respondents were asked to define the features of such an environment, they stressed functionality, privacy, storage, aesthetics, with more emphasis required on ergonomics, adjustability, and responsiveness to workers needs.

Several comparisons were made of offices today with those of 5 years ago. Design and furnishings are more important now than before. More space for support activities is required by most organizations now, with the most prominent uses being conference rooms and work support areas such as duplicating.

The design process was then examined in some detail. User input to workspace and equipment planning was considered to be very important. Workstation design procedures exhibited little uniformity across organizations examined. Workstation categories were based on job categories, functions, status and equipment and differed among organizations and frequently within a given company. The need for more standardization was cited by many respondents. The methods employed in determining space needs also varied with each organization. Status was the greatest determinant of average workstation size.

Open-office designs were contrasted with private offices. The findings were consistent with earlier investigations (1,2). The primary benefits of open offices were judged to be flexibility better communication, reduced initial construction cost and better space use. The lack of acoustical and visual privacy, and increased noise were the predominant drawbacks cited.

The major benefits of private offices were improved privacy and status enhancement, while the disadvantages noted were the lack of flexibility, cost, and isolation.

Virtually all organizations employed standard workstation designs, with space, furnishings and panel attributes being the most frequent features standardized. However, as with many of the other characteristics, considerable variability existed among the organizations examined.

In an attempt to determine the influence of design on productivity, respondents were asked: What qualities should a workstation have to enhance productivity?

As might be expected, the responses covered issues ranging from meeting the desires of occupants, to accommodating functional needs. Other respondents were skeptical about any direct relationship between design and productivity. Privacy, adequate lighting and acoustics, storage, ergonomic design and meeting functional requirements were mentioned often.

When asked to prioritize the key attributes of workstations, sufficient and appropriate working space and acoustic privacy were cited as the most important features. Lighting, flexibility, visual privacy and air quality were also quite important.

Environmental problems associated with technologies in offices were then addressed. With respect to lighting, glare from overhead fixtures and windows and task lighting for VDT's were noted. As for acoustics, noisy equipment and lack of acoustic privacy caused the most difficulties. Thermal comfort was compromised by the heat produced from equipment, and the lack of proper zoning for thermostatic control. Finally, proper air flow and air balancing between offices also contributed to thermal discomfort.

The use of office furniture systems was then explored. The predominant reasons for this selection were flexibility and cost effectiveness.

Respondents were then asked: What would be done differently next time (regarding system furniture planning and purchases)? The need to minimize choices and standardize on a limited number of them was cited, e.g. office dimensions, workstations, panel sizes and colors. In addition, a single furniture manufacturer with stable production and available spare parts was recommended. The significance of adequate shelf space and seating was noted. Finally, the importance of experience with systems furniture by the architect/designer planning the space, was stressed.

The results of this survey were consistent with earlier findings by the author and other research studies (1,2). The investigation however was a limited one. A great deal of experience has been attained by many organizations, in the private and public sectors, in coping with the demands of new office technologies. These experiences constitute a potential major resource for those responsible for using, designing and managing facilities if they were documented. A more comprehensive study of the experiences of organizations designing "automated workplaces" would benefit the building, research, and user communities. It is by developing a data base of such information that will overcome the current practice of "reinventing the wheel" (often a squared one) each time a new building is designed or a new technology introduced in buildings.

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APPENDIX A

2 How would you define a high quality workspace? What are its essential characteristics; in order of importance? (5 features)

- 1 Right size & configuration for intended function; 2 correct amount of storage, 3 worksurfaces with other needs considered
- 1 Function (spatial & technical), 2 comfort (acoustical privacy, 3 personal space, 4 ergonomics, 5 aesthetics
- 1 Function, 2 good environmental controls, 3 pleasant environment
- 1 Supports user needs, not necessarily wants
- 1 Function-adequate work/paper flow, 2 support & conference space access; 3 Environment - comfort, workstation, 4 natural light
- 1 Functional, 2 timeless, 3 practical, 4 efficient, 5 comfortable, 6 economical
- 1 Privacy (Visual,Acoustic), 2 Function, 3 Asthetics, 4 Flexibility
- 1 Worksurface, 2 lighting, 3 filing, 4 privacy, 5 ergonomics
- 1 Appearance, 2 work tools, 3 privacy, 4 colorful, 5 motivates employees
- 1 Clean, 2 contemporary, 3 flexible, 4 consistent, 5 simple
- 1 Enhances tasks, 2 good light, 3 acoustics, 4 storage, 5 aesthetics, 6 privacy
- 1 Location, 2 quality, 3 size
- 1 Functional design, 2 aesthetics, 3 communications, 4 systems furniture
- 1 Functional, 2 flexible, 3 pleasant
- 1 Meets program needs, 2 modern equipment, 3 private offices
- 1 Space, 2 quality furniture, 3 finishes
- 1 Space size, 2 lighting
- 1 Proper equip, 2 adequate size, 3 storage, 4 visual privacy, 5 aesthetics
- 1 Space, 2 storage, 3 comfort
- 1 Well planned space, 2 adequate work surface, 3 storage, 4 computer capability 5 light, 6 acoustics
- 1 Functional, 2 economical, 3 flexible, 4 handsome appearance

10a1 Benefits of open office designs.

Flexibility (12)
 Facilitate interaction/communication (7)
 Reduced initial construction cost (6)
 Better space use/higher densities (6)
 Short knockdown and reerection time (3)
 Decreased workstation size (2)
 Better lighting (2)
 Ability to group people for specific project (2)
 Control subordinates, airiness
 Vertical storage in workstaion; visual interest
 Outside awareness
 Good power/cabbling
 Better HVAC
 Open feeling
 Functional
 Circulation
 Improved phone coverage

10a2 Disadvantages of open office designs.

No privacy (acoustical and/or visual) (13)
 Noisy (9)
 Noisy, no privacy (4)
 Distractions (2)
 Perceived status loss, too flexible (2)
 Maintenance & replacement of systems furniture
 parts, cost, inventory (2)
 Furnishings standardized
 Housekeeping
 Fewer private offices for middle managers

10b1 Benefits of private offices

Privacy & status (7)
 Privacy (3)
 Good acoustics (2)
 Privacy, security (2)
 Privacy, controlled work environment, status needs met
 More private, quiet
 Status, good acoustical privacy, feeling of permanence
 Visual privacy
 Privacy, improve staff interactions
 Private, ability to customize furnishings

10b2 Disadvantages of private offices

Lack of flexibility, cost (8)
 Isolation (3)
 Cost/less teamwork
 Apparent "unavailability"
 Longer construction time,
 More HVAC
 More space, hard and costly to reconfigure, more electrical
 and mechanical costs
 None
 Hard to change, inefficient space utilization
 Space loss, change in layout
 Noisy
 Harder to communicate

10c1 Benefits of semi-private offices

Works well for our application
 N/A
 Not used
 Functional
 More people accomodated, fewer distractions
 Changeable, efficient space use, status better than open
 Communications, changed layout
 Better space use
 Less costly than private, greater occupancy, facilitate joint
 work
 None

10c2 Disadvantages of semi-private offices

Cost
 Noise, lack of privacy
 Private conversations a problem
 Lack of permanence
 Noise, security
 Less privacy
 Distractions, less status

11 How is status accommodated?

Size, furnishings (7)
 Furniture type, finishes (4)
 Private office (4)
 Private office, location (2)
 Size, location (2)
 Standards (2)
 Private office, size, furnishings

11a How does status affect design decisions and layout?

Very little (4)

Window adjacencies, use of corners (2)

Furnishings & workstation size

Requires accommodation of some private offices

More remodeling

Complicates design

More office conference functions

Not at all

Space constraints as in above

Size, location

Formed basis for floor plans

Design no, layout yes

Better locations for higher managers

Must consider status in layout

11b What if any, changes in accommodating status in past 5 years?

None (12)

Uniform office size to minimize alterations (2)

Fewer private offices for professionals and lower level managers

More wood to compensate for less space

Some professionals in open areas

More open offices

Stricter adherence to space standards, less on status items

13 How do you plan for expansion or changes in configuration or size as needs change?

Modular concept, standard grid (6)

Use access floor (4)

Expansion space designed for 5 year period (3)

Open plan; easy rearrangement (2)

Organizational planning projections, historical data

Seldom can build-in expansion; accommodate with movable partitions and systems

Move people, not cubicles

Design based on spline system

Balance kinds and locations of offices

Add rooms or storage as needed

16c What are categories of workstations?

Manager, professional, supervisor, technical, clerical,
messenger, engineer
Manager, professional, technical, clerical/ADP, secretarial
Secretary, clerical, computer, general
Secretary, professional secretary with word processor,
professional
Secretary, general purpose
Sales, administrative, secretary
Job classification
4 person, 2 person, single, lead, supervisor, secretary,
Entry clerical, clerical, para-professional, professional,
supervisor, manager, department manager, director
VP, director, department head, manager, engineer, draftsman,
draftsman, technician, secretary, clerk
Supervisor, engineer, accountant, clerical
Secretary, technical, professional, manager

18 What qualities should workstation have to enhance productivity?

The occupant should like his/her space.
Sufficient space to perform tasks, personal privacy
Quality alone will not enhance productivity
Privacy, noise control, equipment, space
Adequate light, storage & work surface, chair comfort
Desktop space, file storage, VDT space, good lights
Ergonomic design, privacy, good light, adjacencies, storage
Good light, adequate space, space for personal objects
Privacy, adequate storage
Ergonomics, good chair, storage; good light, acoustics,
pleasant
Appearance, lighting, acoustics, color, texture
Communications and lighting flexibility
Flexibility
Privacy, proper equipment and function
Privacy, functional furniture
Lighting, comfort
Proper storage and worksurface space
Comfort, function
Responds to needs
Well lighted, adequate work surface, storage, visitor &
equip space

18a How have these been achieved (workstation design to enhance productivity)?

Providing adequate size, configuration, good lighting,
ventilation and heating
Minimum workstation size, standards, white sound, etc.
Surveys conducted by consultants
Panel heights, location
Included in design of installation
Hard to measure
Systems furn,parabolic light/task lights
Task lighting, standards for personal objects
POE,education,sound masking,user interviews
Raceways; task/ambient lighting
Modular furniture
Interview to determine needs
Overhead storage, task lights
Fixed layout, ceiling lighting

20b Workstation design standards; how arrive at number, size, and designs that were used?

User need research (3)
Function analysis (2)
Past experience (2)
Experience, consultants
Experience, users and consultants
Surveys, interviews, experience
Surveys, user interviews
Equipment & status
Design layouts, equipment needs, building space
Space, component configurations
Traditional use, history
Trial and error
Building constraints, historical data
Consensus

21a Is there a common approach for workstation design, location, etc?

Corporate standards (3)
Office on exterior/open space on interior
Varies by facility type
Teamwork
Organizations, groups, individuals working together in
proximity
Each area differs
Department
Clerical positions at windows, enclosed offices inside
Matrices defining relationships

22 In reviewing workstation design procedure, what worked, what didn't?

The need for standards to be followed as a guide was emphasized. These should be modified to meet functional requirements. Initial intent was to standardize more but many exceptions made Perimeter offices block exterior view for majority shelf space and seating critical/height adjustment user controlled
Interview users; developed furniture and aesthetic guides
Detailed planning wasted; space constraints dictated
Mockups

24 With respect to designing for flexibility, what has been done to facilitate change?

Standardize on few office sizes
Use standard modules for all workstations
Introduce standard office sizes and workstations
Standard workstation components
Maintain good standards, not low bidder
Minimal fixed walls, standardize systems furniture, prewiring of building
Grid system, not custom design for open office
Modular layout where feasible
Some private offices have movable walls, not needed often
Simple open plan system
Access floor for cabling to work space
More full height movable walls, flexible light, data power distribution
Electrical design features
Prewired workstations; heavy electrical use expected
Wiring, power, telecom, task lighting
Use spline concept; utilities in common spline with movable wing walls
Balance level and location of workstation
Movable work stations
More flexibility
Increase aisle width; additional conference areas convertible to later staff needs
Little, work needed

25 In general, how has technology influenced design?

Not much (5)

System design responsiveness to technology (2)

Terminals need more space (3)

Computers have increased wiring requirements, ambient/task lighting needs

Changed office lighting, worksurface configuration

Influenced size and available workspace

New products to reduce costs, aid performance

Computer/phone wiring complicates, lighting problems

Voice and data has made cabling and electrical systems keys

Changed workstation

Flexibility, adaptability to VDTs

26 What specific technologies have influenced design; how?

Computer (5)

CRT equipment needs more space, larger workstations

PC effected lighting, furniture, type of storage, power requirements

PC workstation, new workplace, lighting

PCs, minis, need for clean power

Bright screen graphic reduced individual control needed

Lighting, HVAC, air quality

Access floor; indirect lighting for VDTs; technology rooms for computer equipment

Flat wire, twisted pair technology

Computer, security

Carpet tile eases electrical access; service at walls

Communications, light, power

Voice and data distribution

New wire management, new paper management systems

27 How have you accommodated these technologies?

Reconfiguring and retrofitting furniture (2)

Providing ample space for VDTs & good lighting

Changing office furniture

More computers

Adequate space

Standalone and other systems accommodated in same space

Standards

Everyone has PC at workstation

No change in five years

Basic design

Each station wired with four pair wire

Buying new furniture for VDTs

Multipurpose CAD reduced VDT footprint, more desktop room

Flat wire on slab has not worked on other projects

27b What would you do differently next time?

Plan for more wiring/communication distribution up front
 Return to case goods and wall mounted furniture components
 Allow for more space
 Consider permanent private office partitions
 Use design professionals to plan
 Consider task lighting with ambient
 Build on past experience each time
 Provide more capability for computers

28 How do you provide for change of function, furniture arrangement, equipment, within a workstation?

Modular furniture (6)
 Rearrange components (5)
 Built in workstation flexibility (4)
 Worksurface heights
 More different furniture
 Furniture guidelines/direct design

29 How do you provide for growth (materials storage, added equipment) within each workstation?

Do not (4)
 Add storage units (3)
 Keep storage away from work area (2)
 Add components to workstation
 Workstations may increase slightly in size, using access floor & uniform indirect lighting
 Allow for more vertical storage
 Add file space
 Squeeze/compress standards
 Modular furniture limits
 Modular systems that don't go out of date
 Reconfiguration, more storage
 Keep 10% open; direct design
 Difficult, encourage cleanup every two years
 Provide adequate space at outset for expansion

31 What are environmental problems associated with incorporating new technology into open offices with/without systems furniture, e.g. air quality, lighting, etc.

Noise (10)
 Thermal comfort (8)
 Lighting (7)
 Heat load (6)
 Air quality (4)
 Glare (4)
 Glare problem from overhead fixtures, windows (3)
 24 hr cooling for certain computer equipment
 Proper air flow and air changes, noise
 Air balance between offices, glare on computer screens
 More heat, noise
 Ability to achieve greater density with open task lighting; plan is required
 Thermal comfort, light, noise
 Private office has 3-4 people per thermostat
 Eyestrain-VDT, seating comfort, air quality (chemicals from copier), noisy equipment
 Include special lighting; increasing cooling
 Printer noise, light for VDT
 Acoustics
 All environmental attributes; expensive
 Added heat load, printer noise
 Heat from VDTs
 Acoustics
 Thermal comfort, light, acoustics

32 Any difference in environmental control strategies needed as a result of new technologies and open plan?

Air distribution & control
 Changes in communication cabling strategies
 Tight building - air quality problems; some openable windows,
 Increase air handling capabilities, smoking a problem
 Non-glare light; lighting control, new lighting technologies, special lighting systems
 Different A/C systems, greater use of flexible HVAC, modular heat pump etc; zones can be enlarged, better HVAC control, energy conservation, more cooling
 Acoustic absorbent surfaces

33 How do you control noise within the work environment?

Electronic sound masking (7)
 Carpets (7)
 Acoustic absorbent surfaces (6)
 Acoustic panels (5)
 Acoustical ceiling panels (3)
 Layout configurations (3)
 Private offices (2)
 Management policies on conversation levels
 Insulate walls in private offices
 Printers isolated
 Printer covers

34 How do you determine lighting requirements and kind of light provided in each work area - ambient and individual?

Standards; 50 fc for work surface (2)
 Task/ambient (2)
 Use indirect lighting with about 15% individual task lighting
 Design professionals, experience
 Design for 50 fc maintained in all offices; task lighting where required
 Both; all open stations have 2-36" task lights; light color may be requested
 Standard, job analysis
 Functional evaluation
 IES recommendations
 Computer areas get task/ambient systems; others only ambient
 By area, not function
 Code requirements
 Task lighting
 Ambient 50 fc, circulation 10 fc

35 What is the basis for determining electrical requirements for each workstation?

Standard
 In house standards and guidelines
 Standard, job analysis
 5-6 watts per sq ft of building
 Based on square footage allowance
 Experience; we design for 600W/workstation
 Functional evaluation
 User surveys, ADP consultants, add for unknowns
 Individual interviews, design experience
 Historical use with some added capacity
 Individual requirements and code
 Building designed for 1500; if more they will move
 Plan with user and supervisor
 Needs, past requirements
 Needs
 Equipment needs

35a How is change in electrical requirements accommodated?

Not well (3)

Space needs projected (2)

Add circuits when needed, power contingency plans (2)

Establish guidelines and standards during early planning (2)

Provide building systems flexibility and work station products offering

Maintain buffer space between organizations

Main service sizing only

Expansion space within

Extra outlets

Equipment selection

36 How do you accommodate growing use of electrical technologies in furniture wiring, the office and the workstation itself?

Access floors; no wiring of panels (2)

Prewired furniture (2)

Access flooring, and raceway capacities in wall panels

New buildings will have raised floors; new panels will be electrified

All in floor with minimum power poles

Multi-outlet switch plugs

Work with manufacturer

Plug in systems; examining fiber optics

Powered panels

Raceways, cable installation, trays

Planning

Part of original design

Part of systems evaluation

39a If you use office furniture systems, why did you make this choice?

Flexiblility (7)

Executive decision (2)

Cost effective (3)

Adaptability, movability, expandability

Better space use

To upgrade furniture standard

Recommended by architect

Price and quality of design and materials;

Ergonomic, semi-privacy

Reuse

Efficiency, privacy

Quality,

Local usage

Trend,

Competitive bid situation

39c Have the bases for systems furniture selection changed in the past 5 years, if so, how?

No (13)

Yes; less emphasis on 1st cost & more on quality and flexibility

Worksurface adjustments are becoming more important

More components needed

Narrowing number of systems purchased

Not much

40 Does the user have choices in colors, arrangement, type of furniture; what are they?

No (9)

Yes (12)

Choice of arrangements (3)

Limited choice (3)

Modify for function, color rarely, standard important

Individual review arrangement, management reviews type and colors

Private offices only

Controlled preselected choices

Each category has some choice, depending on functional needs

Users work closely with space planner and architect

46 Based on your experience, with respect to the following, what factors are most important in defining user requirements?

46a. systems furniture

Panel height, color, accessories

Durability, flexibility, range of components, electrical capabilities, raceways and appearance

Work surface, file space, drawer space, workspace height, location of keyboard

Flexibility, maintenance, movability & erection ease

Flexibility

Job requirements, flexibility, cost

Space conservation, ease of change

Panel heights and types, component selection, aesthetics

Aesthetics, flexibility

Vendor continues same model

Based on job needs

Ease in relocating

Cost, electrical use

Flexibility, cost, wire capacity

46b Based on your experience, with respect to the following, what factors are most important in defining user requirements? -
Workstation space needs.

User needs (3)

Size correctly for function and task

Functional tasks, storage, ADP, visitors

Flexibility

Adequate to accommodate equipment and reference/work surfaces

Job requirements, workspace, storage

Efficient equipment location, less space

Standardization and flexibility of panels

Equipment, storage, seating

Grade, use

Function, status

Proper storage and equipment space

Bay depths, corporate standards, user needs

46c Based on your experience, with respect to the following, what factors are most important in defining user requirements? -
Quality workplace.

Acoustical privacy, functional space, personal space, lighting,
air quality, appearance

Adequate space, furniture, lighting, air conditioning, acoustical
privacy

Componentry

Seating and lighting

Appearance

Lighting, HVAC, acoustics

Class A space

Acoustics, lighting, aesthetics

Environment, location

Job functions facilitated

Privacy, visual for all, acoustical for higher levels

Budget/costs

46d Based on your experience, with respect to the following, what factors are most important in defining user requirements? -
Employing new technologies.

Flexibility (4)

Use access floor, modular approach to cabling below floor
and cabling

ADP, communication requirements (phone & LANS), ergonomics

Prewired for voice and data communications, user control of
lighting and A/C

Keep us with changes, trends

Simplify; easier to understand information to keep current

Maintain standards

Plan ahead

Job functions facilitated

46e. Based on your experience, with respect to the following, what factors are most important in defining user requirements? - Accommodating new technologies

System flexibility (3)
Sufficient wiring raceways & electrical capacities
Employee acceptance; overcome resistance to change
Adequate space to start with
Adaption of existing products
Plan ahead
Should be built into workstations

47 Were tradeoffs required when making decisions about items (above) during the design process?

Yes (7)
No (2)
Cost is always a factor
Some
Lighting/acoustics vs cost
User needs

47a. Were tradeoffs required when making decisions about items (above) during the design process? What tradeoffs were needed?

Size for need, not want
Zone control of A/C instead of individual controls
Appearance vs flexibility
Cost vs aesthetics
Delivery time, costs
Removing middle management from private offices
Space size, aesthetics
Cost, office size
Space available vs required

47b How were tradeoff conflicts resolved?

Management review (2)
Corporate policy, & fairness
Negotiation with occupants
Cost prevail in economic analysis when applied against function
Organizational directives, no exceptions
Surveys, user interviews
Functional needs
Many times they haven't been

49a Does a life cycle cost analysis occur and effect any of your planning/design proposals?

A more expensive 1st cost solution may be chosen
 Building subsystems often selected on this basis
 Operating costs & maintenance costs effect design decisions
 Drives basic system selection
 Dont go for low bidder
 Selection of products based on value, not first cost
 System type ordered
 Payback period
 How long it lasts
 In design decisions consider first and long term costs

50 How do you know if your design solutions are successful?

Occupant feedback (7)
 Complaints (3)
 POE (3)
 Engineering analyses or operating cost comparisons (2)
 Do they satisfy goals?
 Visit the building
 Prior experience & good negotiating (total end cost)
 Lived and worked with standard for five plus years
 Comparison with similar facilities
 Past history

52 How do you use the experience of previous projects to improve your present and future planning and design efforts?

Review design process and results; evaluate (3)
 Survey reports (3)
 Modify design assumptions and criteria
 Critique; the same organization is involved in new projects
 Streamline process and document problem areas
 Revise when solutions don't work
 Keep an open mind
 Experience
 Apply what worked in new projects; dont repeat mistakes
 Major influence

53 Was the final environment perceived to be an improvement; how? What, if any problems?

Yes (10)
 Varies, generally viewed as improvement (less for acoustical privacy)
 No; people miss customization
 More space; more orderly appearance; better line of sight to window
 Usually
 Yes, but noise problem exists
 More space, loss of private offices
 Improved lighting, acoustics

Appendix B OFFICE PLANNING QUESTIONNAIRE

PLANNER/DESIGNER

INTRODUCTION:

We are collecting information about how offices, particularly workstations and their facilities are planned and designed. The data will be used to develop criteria and guidelines for future federal efforts in the planning and design of office space. We would like to know what decisions you made during your typical office design process, the basis for the decisions and how they turned out. The major issues discussed are workstation and office design, systems furniture, the quality workspace, the effects of technology on design, and decisions about space allocations. Please think about these issues as a framework for the questions below.

The findings will be summarized and organizations will not be identified with particular responses; i.e. specifics will be confidential unless we are given explicit permission to identify names (see below).

Background Information

Name _____ Tel # _____

Job Title _____

Description of Job _____

Organization, Department, Agency - Name, (Company, firm) Major activity _____

Fortune 500 Company? Yes _____ No _____

Organizational unit (Division, etc) _____

Organizational unit covered in survey (Please check)

___ An entire organization (e.g. Dept of Commerce)

___ A major component of a larger organization (e.g. National Bureau of Standards, Dept of Commerce)

___ An organizational component (e.g. Center for Building Technology, National Bureau of Standards, Dept of Commerce)

Name of organization or component for which data are reported.

I have no objection if you wish to mention the name of our organization in reporting detailed findings.

Signature

* Questions for federal agencies

If there are organizational guidelines and/or standards for workstations and/or spaces, please attach.

A. Planning/Design - General

1. How important is office design and furnishings for organization, end users as compared with 5 years ago? i.e. priority then and now? (circle choice) more same less.

2. How would you define a high quality workspace? What are its essential characteristics; in order of importance?

a. Has that definition changed in the past 5 years? _____

b. If so, why? _____

c. How? _____

3. Do you do your own planning and programming? _____

a. If not, do you rely on professionals. _____

b. Is the process formal (e.g. using standardized questionnaires or interviews) or informal? _____

c. How important is user input in the following?

very somewhat unimportant undesirable

Workspace	()	()	()	()
Furnishings	()	()	()	()
Equipment	()	()	()	()
Arrangement	()	()	()	()
Colors, materials	()	()	()	()
Other, specify _____	()	()	()	()

4. Did you use a CAD system ?(Y?N) _____
 a. Do you use a CAD system now? _____
 b. If so, what kind of information is maintained?(Check)
 All workstations _____
 All workstations components _____
 Connections _____
 Other, please specify _____

5. How are overall space needs determined? _____

6. What proportion or percentage of total space is usable space?
 e.g. building net/gross? _____

- a. Do you categorize space into the following?: (Check)
 _____ Office type (standard level of furnishings, services)
 _____ Special purpose - above standard furn, services
 _____ Storage - less than standard furn, services
 b. If not, how do you categorize space? _____

c. Do you use the following designations in characterizing
 space?: (yes or no)

 - Workstation _____ Common support _____ circulation _____

Other categories _____

d. What is the ratio of common support space to workstation
 space? _____

7. What are the bases for sizes, furnishings and configurations
 of workstations and/or private offices? _____

- a. Job category (job level) _____
 b. Function _____
 c. Other (specify) _____

8. What is the ratio of the following workstations to the total
 office space? private _____ semi-private _____
 open-plan _____

a. What are the bases for assignments? (job category,
 function e.g.) _____

b. What is the percentage of the following in open and semi-
 private and private offices? _____

 managers _____ professionals _____ Technical _____
 clerical _____

9. With respect to open space; how much (%) used now compared
 with 5 years ago (%)? (Circle response)

more same less

Approximately how much? _____

10. What are the benefits and shortcomings of each type of above mentioned space?

a. Open; (1) advantages _____

Open (2) disadvantages _____

b. Private (1) advantages _____

(2) disadvantages _____

c. Semi-private (1) advantages _____

(2) disadvantages _____

11. How is status accommodated? _____

a. How does it affect design decisions and layout? _____

b. What, if any, changes in accommodating status in the past 5 years? _____

12. How much is organizational status reflected in making design decisions today as compared with five years ago?
Please check.

more same less

Furnishings	()	()	()
Space	()	()	()
Personalization	()	()	()
Location	()	()	()
Other (specify)	()	()	()

13. How do you plan for expansion or changes in configuration or size as needs change? _____

a. How important are the following elements in planning for expansion or change? (1-5; 1 being most important)

Square footage per workspace	()
Type of work	()
Status of user	()
Amount of equipment	()
Presence of computer	()
Storage space	()
Variety	()
Uniformity	()
Other, specify	()

14. With respect to support spaces, how do present needs compare with needs 5 years ago?

a. more same less

Conference rooms	()	()	()
Break/smoking areas	()	()	()
Paper storage	()	()	()
Magnetic storage	()	()	()
Work support areas (copying, print)	()	()	()
Other, specify _____	()	()	()

b. With respect to conference rooms, has the ratio of conference room space changed with open plan designs? How? _____
What are ratios? Traditional _____ Open _____

c. With respect to files, what is the trend in space requirements for the following:

	more	same	less
- Paper	()	()	()
- Magnetic media	()	()	()
- Books, reference documents	()	()	()
- Private files	()	()	()
- Common files	()	()	()

B. Workstations

15. How do you determine the activities and needs of the individual at a workstation? (Check)

a. Interview _____

b. Questionnaire survey _____

c. Other (specify) _____

16. Are there categories of workstations based on size, configuration, equipment, etc? (circle choice) Yes No

a. If so, how many categories are there? _____

b. What is the basis for workstation size determination?
(Check response)

(1) Function	()
(2) Status	()
(3) Equipment	()
(4) Other (specify)	()

c. What are the categories of workstations? _____

17. What proportion of workstations are shared? _____
 a. What is the trend in shared workstations? _____

- c. If standards exist, what do they cover? (Please check)
- Furnishings
 - Space
 - Location
 - Panels; heights, colors, etc
 - Phone systems
 - Files
 - Other (specify) _____

18. What qualities should a workstation have to enhance productivity? _____

a. How have some of these been achieved? _____

b. Are users consulted directly for their input? Yes ___ No ___

c. Has productivity been enhanced by design changes? Yes ___
 No ___ Don't know _____. If so, please describe. _____

19. How important are the following workstation features. (1-5; 1 being most important).

Visual privacy	()
Acoustic privacy	()
Individual environmental control	()
Flexibility	()
Standardization	()
Working space	()
Lighting	()
Daylighting access	()
Indoor air quality	()
Other (specify)	()

20. Do you have a number of standard workstation designs? _____

a. If so, are the following categories used and their sizes?-

	Square Footage (Total)	Square Footage (with VDT's)
- Managerial _____	_____	_____
- Professional _____	_____	_____
- Technical _____	_____	_____
- Clerical _____	_____	_____
- Other (specify) _____	_____	_____

b. How did you arrive at the number, size and designs that you did? _____

21. What are the bases for locating workstations in relation to one another, common areas and other building facilities? _____

a. Is there a common approach? If so, specify. _____

22. In reviewing your workstation design procedure, how did the process work out? (What worked, what didn't, why)? _____

23. What would you do differently next time? _____

C. Technology/flexibility

24. With respect to designing for flexibility; what has been done to facilitate change? _____

a. How well has it worked? _____

25. In general, how has technology influenced design? _____

a. What has been the impact of technology on: (Check)

	more	same	less
(1) Workstation space?	()	()	()
(2) Common spaces	()	()	()
(3) Total space	()	()	()
(4) Usable/total	()	()	()
(5) Security	()	()	()

26. What specific technologies have influenced designs? How? _____

a. Have technologies enhanced productivity? Yes _____ No _____
Don't Know _____. If so, please describe. _____

27. How have you accommodated these technologies? _____

a. How well have your solutions worked? (i.e. what worked, what didn't work, why?) _____

b. What would you do differently next time? _____

28. How do you provide for change of function, furniture arrangement, equipment, within a workstation? _____

29. How do you provide for growth (storage of materials, added equipment) within each workstation? _____

30. Does your phone system require a physical change in a move if the workstation stays the same or can it be done in software? _____

a. How often do you replace telephone wire when moving? _____

b. How often do you add new data wires? _____

c. How often do you change data wire because of a move? _____

31. What are the environmental problems associated with incorporating new technology into open offices with/without systems furniture e.g. air quality, thermal comfort, lighting, acoustics, other (specify)? _____

32. Any differences in environmental control strategies needed as a result of new technologies and open plan? _____

33. How do you control noise within the work environment? _____

34. How do you determine lighting requirements and the kind of light provided in each work area - ambient and individual? _____

35. What is the basis for determining electrical requirements for each workstation? _____

a. How is change over time or future expansion needs taken into consideration? _____

36. How do you accommodate the growing use of electrical technologies in the wiring of furniture, the office and the workstation itself? _____

37. What percentage of employees move every year? _____

a. Without workstation configuration. _____

b. Requiring reconfiguration of workstation and/or reconstruction of office space. _____

c. What are major problems in accommodating moves? _____

d. What would you do differently with respect to design, furnishings, etc. on the basis of experience with moves? _____

D. Furnishings

38. How do you define office furniture systems? _____

39. Do you use office furniture systems? Yes _____ No _____

a. If you use them, why did you make this choice? _____

b. What are the bases for systems selection? (priorities, 1, 2, 3, etc.)

___ Large selection of components within system

___ Cost

___ Ease of interchangeability

___ Finish choices

___ Durability

___ Electrical connection features

___ Maintainability

___ Appearance

___ Other, please specify _____

c. Have the bases changed in the past 5 years?

(1) If so, in what way? _____

40. Does the user have choices in colors, arrangement, type of furnishings? What are they? _____

41. Experience with changes in systems furniture.

a. Who makes changes?

- Operating personnel

- Maintenance personnel

- Contractor

- Other (specify) _____

b. On a scale of 1-5, 5 being most difficult, how difficult is it to:

Assemble	()
Disassemble	()
Add/change components	()
Add/change power	()
Add/change telecommunications	()

42. What problems are there in making changes? _____

a. d. What type of furniture is used? (manufacturer, type) _____

b. What worked well? _____

c. What didn't work well? _____

d. What would you do differently next time? _____

43. Do you find a good furniture system allows you to provide less overall square footage per workstation? _____

a. Does this compromise quality? _____

b. How? _____

44. What is the planned life span for furnishings purchased? _____

a. Is there a formal time scale for replacement. _____

b. If so, what is it? _____

c. Is there a maintenance cycle, what is it, what is included in the cycle? _____

d. Is there a supply and or maintenance contract? _____

e. Any differences between maintenance requirements in traditional offices and open offices with systems furniture? If so, specify. _____

f. What is expected life of interior building renovations, other than furnishings? _____

45. How important is durability and ease of maintenance at the workstation? (1-5 scale, 5 being highest) _____

E. Summary Issues

46. Based on your experience, with respect to the following, what factors are the most important in defining requirements for office users?

a. Systems furniture _____

b. Workstation space requirements _____

c. Quality workplace _____

d. Employing new technologies _____

e. Accommodating new technologies _____

47. Were tradeoffs required when making decisions about items (above) during the design process? _____

a. What tradeoffs were needed? _____

b. How were conflicts resolved? _____

48. Would you change the decision making process used if you were faced with similar choices again? _____

a. If so, what changes would you make next time? _____

F. Analysis/feedback

49. Does a life cycle cost analysis occur and effect any of your planning/design proposals? _____

a. If so, how? _____

50. How do you know if your solutions are successful? _____

51. Do you visit the completed projects, or in any way monitor their use over time? _____

52. How do you use the experience of previous projects to improve your present and future planning and design efforts? _____

53. Was the final environment perceived to be an improved one over the previous one; how? what problems? _____

a. Any reduction in space? how much? _____

54. How much influence do office functions and activities influence design decisions as compared with five years ago? (Circle response)

more same less

G. Looking toward the future

55. Is there a trend to reduce space per worker for each of the following levels of employees? (Check)

	somewhat	not much	not at all	more space
a. Top mgmt	()	()	()	()
b. Middle mgmt	()	()	()	()
c. Professional	()	()	()	()
d. Technical	()	()	()	()
e. Clerical	()	()	()	()

56. Which (3-5) factors will contribute most to decisions to update office facilities in the next 5 years? (check)

- a. Expansion of office work force. ()
- b. Reorganization of company. ()
- c. Changes in spatial needs due to new technologies. ()
- d. Desire to increase work output of employees. ()
- e. Rising construction costs ()
- f. Rising HVAC costs. ()
- g. Need for more flexible office layouts. ()
- h. Need for better interdepartmental communications. ()
- i. Desire for more pleasant surroundings for employees. ()
- j. Availability of new types of office systems. ()
- k. Need for more space per employee. ()
- l. Rising costs of lighting. ()
- m. Need for more accessible storage space. ()
- n. Reduction of office work force. ()
- o. Tax depreciation strategies ()
- p. Other (specify) _____ ()

57. Other factors which will be more important in making upgrade decisions in the next 5 years. (3-5) (check)

- a. Internal and external growth ()
- b. High energy costs ()
- c. Flexibility of more work zones; ability to adapt space for different functions. ()
- d. Employee morale; quality of work life. ()
- e. Better physical conditions for workers. ()
- f. High costs of construction, modernization. ()
- g. Worker desire for more individual workspace control. ()
- h. Location of organization; suburbs, inner city. ()
- i. Renovation of old structures. ()
- j. Corporate image. ()
- k. High cost of space rental ()
- l. Flextime ()
- m. Other (specify) _____ ()

58. People with computers (%) _____
 Shared workstations (%) _____
 Individual file space (lin ft) _____
 Shared files (lin ft) _____
 Redundant files (%) _____
 Paper (%) _____
 Paper/other media (%) _____
 (specify) _____

THE FOLLOWING QUESTIONS ARE FOR FEDERAL AGENCIES AND
 ORGANIZATIONS PROVIDING DESIGN SERVICES FOR THEM.

59. In general, is systems furniture a viable alternative for *
 federal agencies to meet economic and quality goals? Why? _____

60. What is your overall utilization ratio (# of total 'office *
 type' sq ft /# of workstations (individual and shared)? _____

a. What was your utilization rate using conventional
 furniture? _____

b. What was your utilization rate before FPMR-D73 _____ *
 After FPMR D-73 _____?

c. In your opinion, is the 135 sq ft workstation attainable*
 in a quality environment? If not why? _____

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11. ABSTRACT (A 200-WORD OR LESS FACTUAL SUMMARY OF MOST SIGNIFICANT INFORMATION. IF DOCUMENT INCLUDES A SIGNIFICANT BIBLIOGRAPHY OR LITERATURE SURVEY, MENTION IT HERE.) This report is intended to provide insights about how offices and workstations are planned and designed in the private and public sectors. Among the issues explored are the quality of the workplace, the effects of technology on design, space allocations, and systems furnishings. The data were collected by a detailed questionnaire survey, administered with the cooperation of the Corporate Architects Committee of the American Institute of Architects (AIA). The respondents were designers and facility managers of major corporations and governmental agencies with broad planning experience and major design responsibilities. The sample is a limited one, including only twenty-two respondents, therefore the findings are indicative of current design practices and experiences. The survey was designed to cover a broad range of topics and provide the opportunity to comment freely about them. As a result, much of the data is in narrative form.												
12. KEY WORDS (6 TO 12 ENTRIES; ALPHABETICAL ORDER; CAPITALIZE ONLY PROPER NAMES; AND SEPARATE KEY WORDS BY SEMICOLONS) acoustics; air quality; design process; ergonomics; furniture systems; lighting; open-office design; post-occupancy-evaluation; space requirements; thermal comfort												
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